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THE
BRITISH COLUMBIA PILOT,

SECOND EDITION,

INCLUDING

THE COAST OF BRITISH COLUMBIA FROM JUAN DE
FUCA STRAIT TO PORTLAND CANAL,

TOGETHER WITH

VANCOUVER AND QUEEN CHARLOTTE ISLANDS.

COMPILED FROM ADMIRALTY SURVEYS.

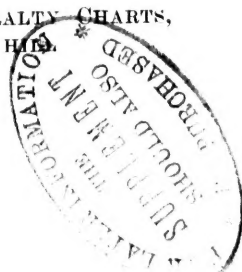
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TO THE

BRITISH COLUMBIA PILOT,

Second Edition, 1898.

THE British Columbia Pilot contains Sailing Directions for the coast from Juan de Fuca strait to Portland canal; with the adjacent Inner channels; also Vancouver and Queen Charlotte islands.

The information relating to the coast from the entrance to Juan de Fuca strait, and Haro and Rosario straits, to Bute inlet, as also to Vancouver island and adjacent channels, was obtained from the journals and surveys conducted by Captain G. H. Richards, R.N., in H.M. Surveying Vessels *Plumper* and *Hecate*, between the years 1857 and 1862. This, together with a description of the included shores of Washington territory, derived from United States Government Surveys, was published as the Vancouver Island Pilot, in 1864.

The coast of the mainland from Bute inlet to Queen Charlotte sound is chiefly derived from the Admiralty survey in charge of D. Pender, Master R.N., 1863-65.

The directions for the coast between Queen Charlotte sound and Portland canal, with the adjacent Inner channels, are chiefly derived from the Admiralty survey conducted by Staff Commander D. Pender, R.N., during the years 1865-70. The description of Queen Charlotte islands is compiled chiefly from the report by G. M. Dawson, Esq., F.G.S., published by the Government of Canada, 1880, to which is added information derived from a visit of H.M.S. *Virago* in 1853, and from the Admiralty Survey of 1866. These were originally published as the Vancouver Island Pilot Supplement, in 1883.

In 1888, the above-mentioned, viz., Vancouver Island Pilot, 1864, and the Vancouver Island Pilot Supplement, 1883, were embodied and published as the British Columbia Pilot, having been prepared by Staff Commander F. W. Jarrad and Captain W. H. Sharp, R.N.

In the present (Second) edition of the British Columbia Pilot, the most recent information derived from the Remark books of officers of Her Majesty's ships, the Government of Canada, Mr. Walbran, commanding the Dominion Government steam-vessels, *Danube* and *Quadra*, and from other sources, including the Coast of British Columbia with Puget sound, 1891, also the Pacific Coast Pilot, Alaska, Part I., 1891, published by the United States Government, has also been embodied.

This Second Edition has been prepared by Staff Captain W. H. Petley, R.N., of the Hydrographic Department, Admiralty.

Notices of errors or omissions in this work, as well as any new information of interest to the navigator, should be transmitted to the Secretary of the Admiralty.

By the publication of this work, the former Edition and Supplements to British Columbia Pilot, 1888 ; also all Hydrographic Notices relating to them and all Notices to Mariners, inclusive of No. 328 of 1898, are cancelled.

W. J. L. W.

Hydrographic Office, Admiralty, London.

July 1898.

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SYSTEM OF ORTHOGRAPHY.

Adopted by the Admiralty for Sailing Directions and Charts.

As far as has been found possible with existing knowledge, native names are spelt in accordance with the following system, which has been adopted by the principal authorities in Great Britain and by the United States, and has been for some years in process of gradual introduction into all Admiralty Sailing Directions and Charts.

No change is made in the orthography of foreign names in countries which use Roman Letters; thus French, Spanish, Portuguese, Dutch, &c. names will be spelt as by the respective nations.

1. Where native names have been so long written in a form which, though not in accordance with this system, has become familiar to English eyes from being so spelt in all charts and maps, they are retained.

2. The true sound of the word as locally pronounced is taken as the basis of the spelling.

3. An approximation of the sound is alone aimed at. A system which would attempt to represent the more delicate inflections of sound and accent would be so complicated as only to defeat itself.

4. The broad features of the system adopted are that vowels are pronounced as in Italian and consonants as in English, *every letter being pronounced*. Two accents only are used:—

- (1.) The acute, to denote the syllable on which stress is laid. The use of this is very important, as the sounds of many names are entirely altered by the misplacement of this "stress."
- (2.) The sign $\sim$ over the letter U to denote the short sound of that vowel under certain circumstances. (See table.)

5. When two vowels come together, each one is sounded, though the result, when spoken quickly, is sometimes scarcely to be distinguished from a single sound, as in *ai, au, ei*.

The amplification of the rules is given on the following pages.

Information is invited as to the proper spelling of native names, so as to produce the nearest approximation to the true sound, by this system.

Letters.	Pronunciation and Remarks.	Examples.
a	<i>ah</i> , <i>a</i> as in <i>father</i> - - - -	Java, Banána, Somáli, Bari.
e	<i>eh</i> , <i>e</i> as in <i>benefit</i> ; <i>a</i> as in <i>fate</i> - -	Tel-el-Kebír, Oléleh, Yezo, Levúka, Peru.
i	English <i>e</i> ; <i>i</i> as in <i>ravine</i> ; the sound of <i>ee</i> in <i>beet</i> . Thus, not <i>Feejee</i> , but	Fiji, Hindi.
o	<i>o</i> as in <i>mote</i> - - - -	Tokyo.
u	long <i>u</i> as in <i>flute</i> ; the sound of <i>oo</i> in <i>boot</i> . <i>oo</i> or <i>ou</i> should never be employed for this sound. Thus, not <i>Zooloo</i> or <i>Zoulou</i> , but	Zulu, Sumatra.
	The shorter sound of the different vowels, when necessary to be indicated, can be expressed by doubling the consonant that follows. The sounds referred to are as follows:— The short <i>a</i> as in <i>fut'ter</i> , as compared with the long <i>a</i> as in <i>father</i> . The short <i>e</i> as in <i>better</i> , as compared with the long <i>e</i> as in <i>fate</i> . The short <i>i</i> as in <i>sinner</i> , as compared with the long <i>i</i> as in <i>ravine</i> . The short <i>o</i> as in <i>sobbing</i> , as compared with the long <i>o</i> as in <i>sober</i> . The short <i>u</i> as in <i>rubber</i> , as compared with the long <i>u</i> as in <i>rubric</i> .	Yarra, Tanna, Mecca, Jidda, Bonny.*
ũ	is the same short sound of <i>u</i> as is denoted by doubling the consonant following, but is used, and only used, where such doubling is impossible, as in case of words where <i>u</i> is followed by two different consonants, as in <i>Tũng</i> , pronounced as the English <i>tongue</i> . Doubling of a vowel is only necessary where there is a distinct repetition of the single sound.	Nuulúa, Oosima.
ai	English <i>i</i> as in <i>ice</i> - - - -	Shanghai.
au	<i>ow</i> as in <i>how</i> . Thus, not <i>Foochow</i> , but	Fuchau.
ao	is slightly different from <i>au</i> - - - -	Macao.
aw	when followed by a consonant or at the end of a word, as in <i>law</i> - - - thus	Cawnpore.

* The *y* is retained as a terminal in this word under rule 1. The word is given as a familiar example of the alteration in sound caused by the second consonant.

Letters.	Pronunciation and Remarks.	Examples.
ei	is the sound of the two Italian vowels, but is frequently slurred over, when it is scarcely to be distinguished from <i>ey</i> in the English <i>they</i> , or <i>ei</i> in <i>eight</i> .	Beirút, Beilul.
b	English <i>b</i> .	
c	is always soft, but is so nearly the sound of <i>s</i> that it should be seldom used. If <i>Celébes</i> were not already recognised it would be written <i>Setébes</i> .	Celébes.
ch	is always soft, as in <i>church</i> - - -	Chingehin.
d	English <i>d</i> .	
f	English <i>f</i> . <i>Ph</i> should not be used for the sound of <i>f</i> . Thus, not <i>Haiphong</i> , but -	Haifong, Nafa.
g	is always hard. (Soft <i>g</i> is given by <i>j</i>) -	Galápagos.
h	is always pronounced when used.	
hw	as in <i>what</i> , better rendered by <i>hw</i> than <i>wh</i> , or <i>h</i> followed by a vowel. Thus, <i>Hwang ho</i> , not <i>Whang ho</i> or <i>Hoang ho</i> .	Hwang ho, Ngan hwei.
j	English <i>j</i> . <i>Dj</i> should never be put for this sound.	Japan, Jinchuen.
k	English <i>k</i> . It should always be put for the hard <i>c</i> . Thus, not <i>Corea</i> , but - -	Korea.
kh	The Oriental guttural - - -	Khan.
gh	is another guttural, as in the Turkish - -	Dagh, Ghazi.
l	} As in English.	
m		
n		
ng	has two separate sounds, the one hard as in the English word <i>finger</i> , the other as in <i>singer</i> . As these two sounds are rarely employed in the same locality, no attempt is made to distinguish between them.	
p	As in English.	
ph	As in <i>loophole</i> - - -	Mokpho, Chemulpho.
th	Stands both for its sound in <i>thing</i> , and as in <i>this</i> . The former is most common - -	Bethlehem.
q	should never be employed; the sound of <i>qu</i> in <i>quiver</i> is given as <i>kw</i> . When <i>qu</i> has the sound of <i>k</i> , as in <i>quoit</i> , it should be given by <i>k</i> .	Kwangtung.

Letters.	Pronunciation and Remarks.	Examples.
r	As in English.	
s	As in <i>sin</i> .	
sh	} As in English. - - - - -	Sawákin.
t		
v		
w		
x		
y	is always a consonant, as in <i>yard</i> , and therefore should never be used as a terminal, <i>i</i> or <i>e</i> being substituted. Thus, not <i>Mikindány</i> or <i>Wady</i> , but not <i>Kwaly</i> , but	Kikūyu. Mikindáni, Wadi. Kwale. Zulu.
z	English <i>z</i> - - - - -	
zh	French <i>j</i> , or as <i>s</i> in <i>treasure</i> - - - - - Accents should not generally be used, but where there is a very decided emphatic syllable or stress which affects the sound of the word, it should be marked by an <i>acute</i> accent.	Muzhdaha. Tongatábu, Galápagos, Paláwan, Saráwak.

In the case of native names in countries under the dominion of other European powers, in whose maps, charts, &c. the spelling is given according to the system adopted by that power, such orthography is, as a rule, disregarded, and the names are spelt according to the British system. Thus the island east of Java in possession of the Dutch is spelt Madoera by them, but on Admiralty charts Madura. A town in Java appears on Dutch charts as Tjilatjap; in the British, Chilachap.

INFORMATION RELATING TO CHARTS, SAILING DIRECTIONS, AND THE GENERAL NAVIGATION OF H.M. SHIPS.

ON THE CORRECTION OF CHARTS, LIGHT LISTS, AND SAILING DIRECTIONS.

THERE are three descriptions of publications as guides to navigation—the charts, the sailing directions, and the light lists—which are all affected by the continual changes and alterations that take place.

Of these the charts should always be, so far as our knowledge permits, absolutely correct to date; and the light lists should be noted for the recent alterations, though space will not permit of full details being always inserted; the sailing directions, however, cannot, from their nature, be so corrected, and *in all cases where they differ from charts, the charts must be taken as the guide.*

1. *Charts.*—When issued to a ship on commissioning, the charts have received all necessary corrections to date. As sent from the Hydrographic Office they are, as a rule, fresh from the plates. They then receive such corrections by hand in the dépôts as are required, and are so issued to the ships.

All small but important corrections that can be made by hand are notified by Notices to Mariners, and should at once be placed on the charts to which they refer.

Large corrections that cannot be conveniently thus made are put upon the plates, and fresh copies are issued to the ships to replace the others, which are directed to be destroyed to prevent the possibility of their being used in the navigation of the ship.

The dates on which these large corrections are made are noted on the chart plates in the middle of the lower edge; those of the smaller corrections at the left-hand lower corners.

In all cases of quotations of charts, these dates of corrections should be given, as well as the number of the chart (which will be found in the lower right-hand corner), in order that at the Admiralty it may be known what edition of the chart is referred to.

2. *The Light Lists*, annually published at the beginning of each year, are not corrected in the depôts before issue, but appendices are issued every two months, giving the alterations that have taken place, copies of which are put into the chart boxes.

It is the duty of the navigating officer when he receives the set of charts to make notations in the light lists from these appendices, and from the Notices to Mariners in the box; and to keep them so corrected from time to time.

The Light Lists should always be consulted as to details of a light, as the description in the Sailing Directions may be obsolete, in consequence of changes made since publication.

3. *The Sailing Directions* are not corrected before issue, except occasionally for very important new rocks or dangers. Hydrographic Notices and Supplements referring to each volume are published from time to time.

Supplements contain all the information received up to date since the publication of the volume to which they refer, and cancel all previous Hydrographic Notices.

Hydrographic Notices contain all information up to date since the publication of the volume, or since the last Supplement or Hydrographic Notice, but endeavour is made to issue no more than one of these affecting each volume, and, on the collection of fresh information, to include the former Notice in a Supplement.

The existence of Supplements or Hydrographic Notices is to be noted, in the tabulated form placed for the purpose inside the cover of each volume, in cases when such notations have not been made before issue, and also on receipt of further Notices after commission.

Notes should be made in the margin of the volume of sailing directions affected, as references to the Supplements or Hydrographic Notices when the latter are printed on both sides.

To enable the books to be more conveniently corrected, however, such Supplements and Hydrographic Notices as are of moderate size are now being printed on one side only, and two copies are issued to each ship; one to cut up, the slips being pasted in at the appropriate place; the other to retain intact for reference.

To make these notations or paste in these slips is one of the early duties of a navigating officer after drawing his box of charts and books, and similar notes are to be made from Notices to Mariners that may thereafter be received.

It must, however, be thoroughly understood that sailing directions will never be correct in all details, except up to the date of the last Hydrographic Notice or Supplement, and that, as already stated, when differences exist, the chart, which should be corrected from the most recent information, should be taken as the guide; for which purpose, for ordinary navigation, they are sufficient.

THE USE OF CHARTS AS NAVIGATIONAL AIDS, AND GENERAL REMARKS RELATING TO PRACTICAL NAVIGATION.

1. Accuracy of a Chart.—The value of a chart must manifestly depend upon the accuracy of the survey on which it is based, and this becomes more important the larger is the scale of the chart.

To estimate this, the date of the survey, which is always given in the title, is a good guide. Besides the changes that, in waters where sand or mud prevails, may have taken place since the date of the survey, the earlier surveys were mostly made under circumstances that precluded great accuracy of detail, and until a plan founded on such a survey is tested, it should be regarded with caution. It may, indeed, be said that, except in well-frequented harbours and their approaches, no surveys yet made have been so minute in their examination of the bottom as to make it certain that all dangers have been found. The fulness or scantiness of the soundings is another method of estimating the completeness of a chart. When the soundings are sparse or unevenly distributed, it may be taken for granted that the survey was not in great detail.

Blank spaces among soundings mean that no soundings have been obtained in these spots. When the surrounding soundings are deep it may with fairness be assumed that in the blanks the water is also deep; but when they are shallow, or it can be seen from the rest of the chart that reefs or banks are present, such blanks should be regarded with suspicion. This is especially the case in coral regions and off rocky coasts, and it should be remembered that in waters where rocks abound it is always possible that a survey, however complete and detailed, may have failed to find every small patch.

A wide berth should therefore be given to every rocky shore or patch, **and this rule should be invariably followed, viz., that instead of considering a coast to be clear unless it is shown to be foul, the contrary should be assumed.**

2. Fathom Lines a Caution.—Except in plans of harbours that have been surveyed in detail, the five-fathom line on most Admiralty charts is to be considered as a caution or danger line against unnecessarily approaching the shore or bank within that line, on account of the possibility of the existence of undiscovered inequalities of the bottom, which nothing but an elaborate detailed survey could reveal. In general surveys of coasts or of little frequented anchorages, the necessities of navigation do not demand the great expenditure of time required for such a detailed survey. It is not contemplated that ships will approach the shores in such localities without taking special precautions.

The ten-fathom line is, on rocky shores, another warning, especially for ships of heavy draught.

Charts where no fathom lines are marked must be especially regarded with caution, as it generally means that soundings were too scanty and the bottom too uneven to enable them to be drawn with accuracy.

Isolated soundings, shoaler than surrounding depths, should always be avoided, especially if ringed round, as there is no knowing how closely the spot may have been examined.

3. Chart on largest scale always to be used.—It sometimes happens that, from press of work, only the copper plate of the larger scale chart of a particular locality can at once receive any extensive re-arrangement of coastline or soundings. This is an additional reason, besides the obvious one of the greater detail shown on a larger scale chart, why this largest scale chart should always be used for navigating.

4. Caution in using small Scale Charts.—In approaching the land or dangerous banks, regard must always be had to the scale of the chart used. A small error in laying down a position means only yards on a large scale chart, whereas on a small scale the same amount of displacement means large fractions of a mile. This is particularly to be observed when coming to an anchor on a narrow ledge of convenient depth at some distance from the shore.

For the same reason bearings to objects near should be used in preference to objects farther off, although the latter may be more prominent, as a small error in bearing or in laying it down on the chart has a greater effect in misplacing the position the longer the line to be drawn.

5. Distortion of Printed Charts.—The paper on which charts are printed has to be damped. On drying distortion takes place from the inequalities in the paper, which greatly varies with different paper and the amount of the original damping; but it does not affect navigation. It must not, however, be expected that accurate series of angles taken to different points will always exactly agree, when carefully plotted upon the chart, especially if the lines to objects be long. The larger the chart the greater the amount of this distortion.

6. Buoys.—It is manifestly impossible that any reliance can be placed on buoys always maintaining their exact position. Buoys should therefore be regarded as warnings and not as infallible navigating marks, especially when in exposed positions; and a ship should always, when possible, be navigated by bearings or angles of fixed objects on shore and not by buoys.

Gas Buoys.—The lights shown by gas buoys cannot be implicitly relied on, as if occulting the apparatus may get out of order, or the light may be altogether extinguished.

7. Lights.—Circles drawn on charts round a light are not intended to give information as to the distance at which it can be seen, but solely indicate, in the case of lights which do not show equally in all directions, the bearings between which the variation, or visibility, or obscuration of the light occurs.

All the distances given in the Light Lists and on the charts for the visibility of lights are calculated for a height of an observer's eye of 15 feet. The table of distances visible due to height at end of each Light List, affords a means of ascertaining how much more or less the light is visible should the height of the bridge be more or less. The glare of a powerful light is often seen far beyond the limit of visibility of the actual rays of the light, but this must not be confounded with the true range. Again,

refraction may often cause a light to be seen farther than under ordinary circumstances.

When looking out for a light at night, the fact is often forgotten that from aloft the range of vision is much increased. By noting a star immediately over the light a very correct bearing may be afterwards obtained from the standard compass.

The intrinsic power of a light should always be considered when expecting to make it in thick weather. A weak light is easily obscured by haze, and no dependence can be placed on its being seen.

The power of a light can be estimated by remarking its order, as given in the Light Lists, and in some cases by noting how much its visibility in clear weather falls short of the range due to the height at which it is placed. Thus, a light standing 200 feet above the sea, and only recorded as visible at 10 miles in clear weather, is manifestly of little brilliancy, as its height would permit it to be seen over 20 miles, if of any power. (See table in Light List above mentioned.)

8. Fog Signals.—Sound is conveyed in a very capricious way through the atmosphere. Apart from wind, large areas of silence have been found in different directions and at different distances from the origin of a sound, even in clear weather. Therefore too much confidence should not be felt in hearing a fog signal. The apparatus, moreover, for sounding the signal often requires some time before it is in readiness to act. A fog often creeps imperceptibly towards the land, and is not observed by the people at a lighthouse until it is upon them; whereas a ship may have been for many hours in it, and approaching the land. In such a case no signal may be sounded. When sound has to travel against the wind, it may be thrown upwards; in such a case, a man aloft might hear it when it is inaudible on deck.

Taken together, these facts should induce the utmost caution in closing the land in fogs. The lead is generally the only safe guide.

9. Tides and Tidal Streams.—In navigating coasts where the tidal range is considerable, caution is always necessary. It should be remembered that there are indraughts to all bays and bights, although the general run of the stream may be parallel to the shore.

The turn of the tidal stream off shore is seldom coincident with the time of high and low water on the shore. In open channels, the tidal stream ordinarily overruns the turn of the vertical movement of the tide by three hours, forming what is usually known as tide and half-tide, the effect of

which is that at high and low water by the shore the stream is running at its greatest velocity.

In crossing a bar or shallow flats, the table (B) at page 98 of the Tide Tables will be found of great assistance in calculating how much the water has risen or fallen at any hour of the tide.

On coasts where there is much diurnal inequality in the tides, the amount of rise and fall can never be depended upon, and additional caution is necessary.

It should also be remembered that at times the tide falls below the level of low-water ordinary springs. This always occurs on the coasts of Europe at the equinoxes, but in other parts of the world, and especially in the tropics, such periodic low tides may coincide more frequently with the solstices. Wind or a high barometer may produce it at any time, and the amount varies with locality. When the moon's perigee coincides with the full or new moon the same effect is often produced.

10. Current Arrows on charts only show the most usual or the mean direction of a tidal stream or current. It must never be assumed that the direction of a stream will not vary from that indicated by the arrow. In the same manner, the rate of a stream constantly varies with circumstances, and the rate given on the chart is merely the mean of those found during the survey, possibly from very few observations.

11. Fixing Position.—The most accurate method of fixing a position relative to the shore is by angles between well-defined objects on the chart. All ships are now being supplied with a station-pointer, and this method should be used whenever possible.

Two things are, however, necessary to its successful employment. First, that the objects be well chosen; and second, that the observer is skilful and rapid in his use of the sextant.

For the former, reference can be had to the pamphlet on the use of the station-pointer, which is in every chart box.

The latter is only to be obtained by practice.

It will readily be seen that in war time, when the compass may be knocked away, or rifle-fire may make it undesirable to expose the person more than necessary, a sextant offers great advantages, as angles can be obtained from any position whence the objects are visible. It is this contingency that makes it especially desirable that all navigating officers should become expert in this method of fixing a ship's position.

In many narrow waters also, where the objects may yet be at some distance, as in coral harbours or narrow passages among mud banks, navigation by sextant and station-pointer is invaluable, as a true position can only be obtained by its means. A small error in either taking or plotting a bearing under such circumstances may put the ship ashore.

It is not intended that the use of the compass to fix the ship should be given up; there are many circumstances in which it may be usefully employed, but errors more readily creep into a position so fixed.

In all cases where great accuracy of position is desired, angles should invariably be used, such as the fixing of a rock or shoal, or of additions to a chart, as fresh soundings or new buildings. In all such cases angles should be taken to several objects, the more the better; but five objects is a good number, as the four angles thus obtained not only prevent any errors, but they at once furnish a means of checking the accuracy of the chart itself. In the case of ordinary soundings, it is only necessary to take a third angle now and then; firstly, to check the general accuracy of the chart as above stated; secondly, to make certain that the more important soundings, as at the end of a line, are correctly placed.

Sometimes, when only two objects are visible, a compass bearing and sextant angle may be used with advantage.

In passing near a point of land, or an island, the method of fixing by doubling the angle on the bow is invaluable. The ordinary form of it, the so-called "four-point bearing," when the bearing is taken four points on the bow, and on the beam, the distance from the object at the latter position being the distance run between the times of taking the two bearings, gives an excellent fix for a departure, but does not ensure safety, as the point, and probably the rocks off it, are abeam before the position is obtained.

By taking the bearings of two points and four points on the bow, a very good position is obtained before the object is passed; the distance of the latter at the second position being, as before, equal to the distance run in the interval, allowing for current.

A table of factors, by which to multiply the distance run, to obtain the distance of the object when any number of degrees between the two bearings has been observed, is now supplied in all chart boxes.

The use of a danger angle in passing outlying rocks with land behind should also not be forgotten. In employing this method, however, caution is necessary, as should the chart be not accurate, *i.e.*, should the

objects selected be not quite correctly placed, the angle taken off from it may not serve the purpose. It should not, therefore, be employed when the survey is old or manifestly imperfect.

In fixing by the compass, it must always be remembered that two bearings only are liable to error. An absolute error may be made in either bearing observed; errors may be made in applying the deviation; or errors may creep in in laying them on to the chart. For these reasons, a third or check bearing of some other object should be taken, especially when near the shore or dangers. The coincidence of these three lines will prevent any mistakes.

In ships still fitted with the Admiralty standard compass, the tripod supplied to hold the lamp will be found of great service in fixing position at night, as by its aid a bearing can be as accurately taken as in daylight. With Thomson's compass bearings can also be accurately observed at night. The utility of this in connection with ascertaining the change of bearing of an approaching ship's light should not be forgotten.

Amongst astronomical methods of fixing a ship's position, attention is drawn to the great utility of Sumner's method. A Sumner line, that is, a line drawn through the position (obtained by an assumed latitude and longitude by chronometer) at right angles to the bearing of the sun as obtained from the azimuth tables, gives at times invaluable information, as the ship must be somewhere on that line provided the chronometer is correct. A deep cast at the same time may often serve to get an approximate position on the line. An early and very accurate position can be also obtained by Sumner's method, by getting longitude by a bright star at daylight when the horizon is well visible, and another longitude by the sun when a few degrees above the horizon, or by observing two or more stars at twilight. The Sumner lines drawn through the two positions thus obtained will, if the bearing of sun and star differ three points or more, give an excellent result.

12. Change of Variation of the Compass.—The gradual change in the variation must not be forgotten in laying down positions by bearing on charts. The magnetic compasses placed on the charts for the purpose of facilitating plotting become in time slightly in error, and in some cases, such as with small scales, or when the lines are long, the displacement of position from neglect of this change may be of importance. The Compasses are re-engraved when the error amounts to a quarter of a point,

but the chart plates cannot be corrected more frequently from the impossibility of making alterations too often on one spot in a copper plate.

The geographical change in the variation is in some parts of the world sufficiently rapid to need consideration. For instance, in approaching Halifax from Newfoundland the variation changes 10° in less than 500 miles. The variation chart should be consulted on this head.

13. Local Magnetic Disturbance of the Compass on board Ship.—The term "local magnetic disturbance" has reference only to the effects on the compass of magnetic masses external to the ship in which it is placed. Observation shows that disturbance of the compass in a ship afloat is experienced only in a few places on the globe.

Magnetic laws do not permit of the supposition that it is the visible land which causes such disturbance, because the effect of a magnetic force diminishes in such rapid proportion as the distance from it increases that it would require a local centre of magnetic force of an amount absolutely unknown to affect a compass half a mile distant.

Such deflections of the compass are due to magnetic minerals in the bed of the sea under the ship, and when the water is shallow, and the force strong, the compass may be temporarily deflected when passing over such a spot, but the area of disturbance will be small, unless there are many centres near together.

The law which has hitherto been found to hold good as regards local magnetic disturbance is, that north of the magnetic equator the north end of the compass needle is attracted towards any centre of disturbance; south of the magnetic equator it is repelled.

It is very desirable that whenever a ship passes over an area of local magnetic disturbance, the position should be fixed, and the facts reported as far as they can be ascertained.

14. Use of Oil for Modifying the Effect of Breaking Waves.—Many experiences of late years have shown that the utility of oil for this purpose is undoubted, and the application simple.

The following may serve for the guidance of seamen, whose attention is called to the fact that a very small quantity of oil, skilfully applied, may prevent much damage both to ships (especially the smaller classes) and to boats, by modifying the action of breaking seas.

The principal facts as to the use of oil are as follows :—

1. On free waves, *i.e.*, waves in deep water, the effect is greatest.

2. In a surf, or waves breaking on a bar, where a mass of liquid is in actual motion in shallow water, the effect of the oil is uncertain ; as nothing can prevent the larger waves from breaking under such circumstances ; but even here it is of some service.

3. The heaviest and thickest oils are most effectual. Refined kerosene is of little use ; crude petroleum is serviceable when nothing else is obtainable ; but all animal and vegetable oils, such as waste oil from the engines, have great effect.

4. A small quantity of oil suffices, if applied in such a manner as to spread to windward.

5. It is useful in a ship or boat, both when running, or lying to, or in wearing.

6. No experiences are related of its use when hoisting a boat up in a sea-way at sea, but it is highly probable that much time and injury to the boat would be saved by its application on such occasions.

7. In cold water, the oil, being thickened by the lower temperature, and not being able to spread freely, will have its effect much reduced. This will vary with the description of oil used.

8. The best method of application in a ship at sea appears to be : hanging over the side, in such a manner as to be in the water, small canvas bags, capable of holding from one to two gallons of oil, such bags being pricked with a sail needle to facilitate leakage of the oil.

The position of these bags should vary with the circumstances. Running before the wind they should be hung on either bow—*e.g.*, from the cathead—and allowed to tow in the water.

With the wind on the quarter the effect seems to be less than in any other position, as the oil goes astern while the waves come up on the quarter.

Lying to, the weather bow and another position farther aft seem the best places from which to hang the bags, with a sufficient length of line to permit them to draw to windward, while the ship drifts.

9. Crossing a bar with a flood tide, oil poured overboard and allowed to float in ahead of the boat which would follow with a bag towing astern,

would appear to be the best plan. As before remarked, under these circumstances the effect cannot be so much trusted.

On a bar with the ebb tide it would seem to be useless to try oil for the purpose of entering.

10. For boarding a wreck, it is recommended to pour oil overboard to windward of her before going alongside. The effect in this case must greatly depend upon the set of the current, and the circumstances of the depth of water.

11. For a boat riding in bad weather from a sea anchor, it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil is diffused well ahead of the boat, and the bag can be readily hauled on board for refilling if necessary.

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IN THIS WORK THE BEARINGS ARE ALL MAGNETIC,
EXCEPT WHERE MARKED AS TRUE.

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60 TO A DEGREE OF LATITUDE.

ONE CABLE'S LENGTH IS ASSUMED TO BE EQUAL TO
100 FATHOMS, OR THE TENTH PART OF A MILE.

THE SOUNDINGS ARE REDUCED TO LOW WATER OF
ORDINARY SPRING TIDES.

THE BEARINGS OF SECTORS OF LIGHTS ARE GIVEN FROM
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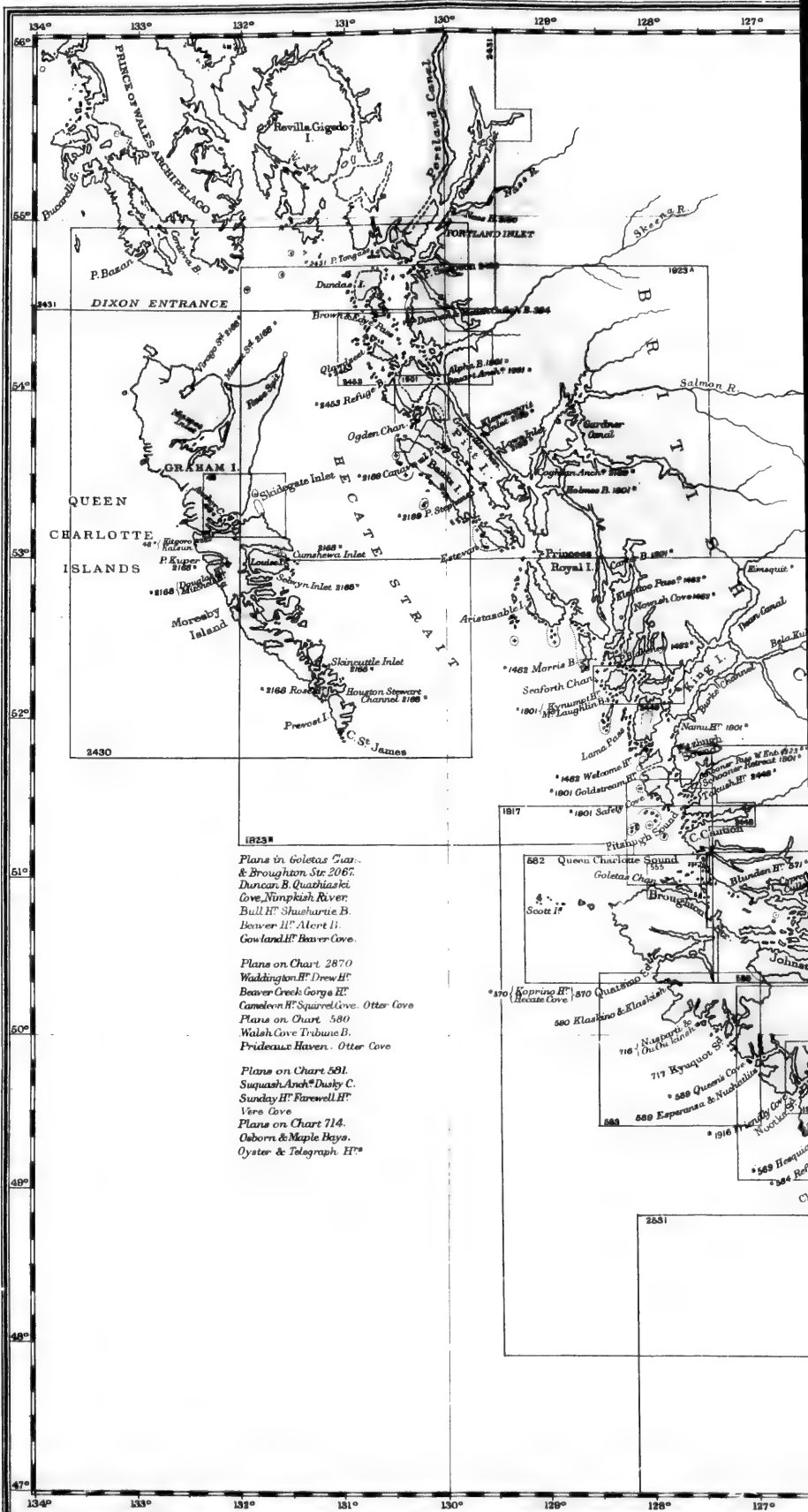
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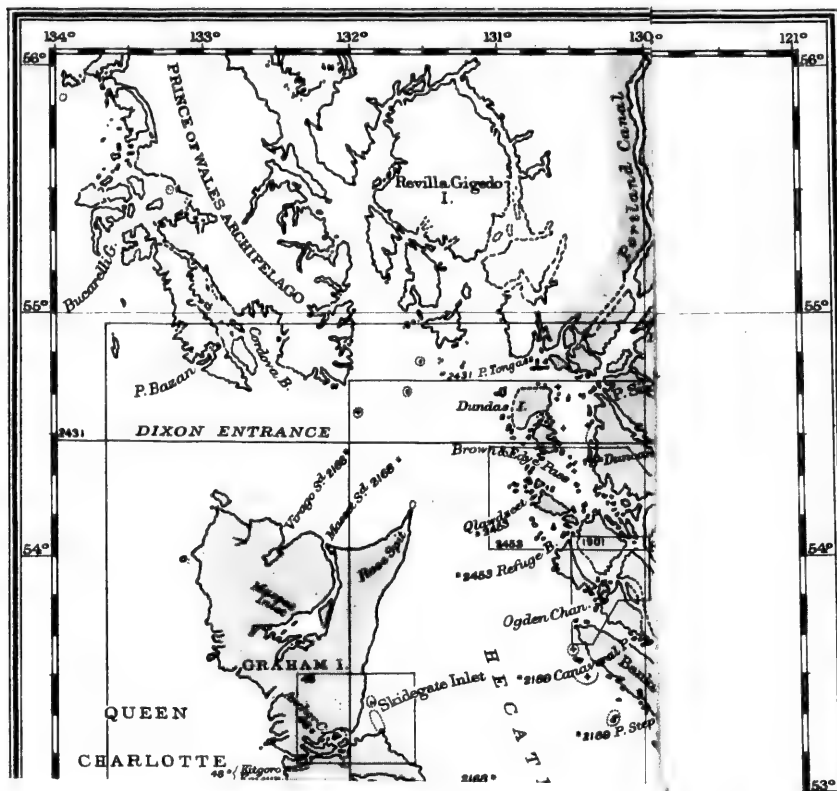
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THE BRITISH COLUMBIA PILOT.

CHAPTER I.

GENERAL REMARKS.—WINDS.—CURRENTS.—CLIMATE.—
METEOROLOGY.—PRODUCTS.—PASSAGES

For later information respecting the lights which are described in this work, seamen should consult the Admiralty List of Lights in South America, Western Coast of North America, Pacific Islands, &c., Part VII. This list is published early in the current year, corrected to the previous 31st December.

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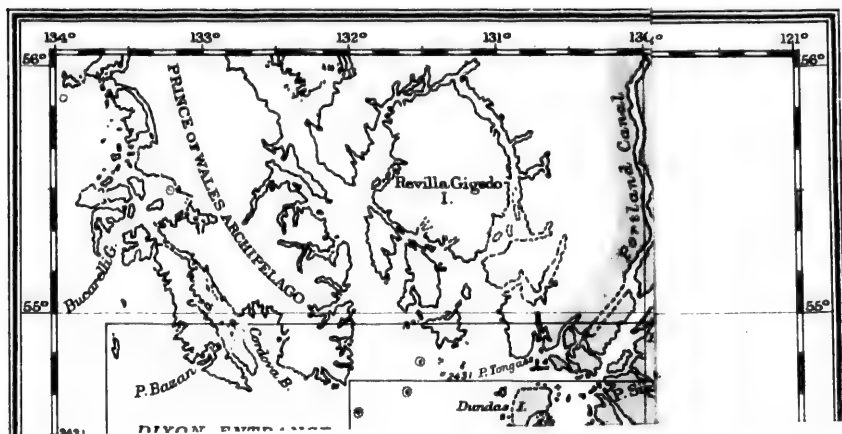
the reign of Charles II.

Products.—British Columbia contains extensive tracts of arable land, and a large auriferous district. Gold was first discovered on Thompson river in 1858.

Wheat, barley, oats, potatoes, peas, vegetables, and fruits flourish in British Columbia. The fisheries are very rich, salmon is abundant, the export of which, chiefly in tins, constitutes one of the principal sources of wealth in the country; it is also an important part of the food of the Indians. Houlican (Oolachan), a fish somewhat resembling the herring, cod, herring, halibut (of enormous size), sardines, anchovy, haddock, and oysters are also found.

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THE BRITISH COLUMBIA PILOT.

CHAPTER I.

GENERAL REMARKS.—WINDS.—CURRENTS.—CLIMATE.—
METEOROLOGY.—PRODUCTS.—PASSAGES.

BRITISH COLUMBIA, a province of the Dominion of Canada, entered the Confederation in 1871. It includes Vancouver island (first constituted a British colony in 1849), also the numerous islands and adjacent mainland of North America lying between Roberts point in Georgia strait, latitude 49° N., and the centre of Portland canal, latitude $54^{\circ} 40'$ N. to 56° N. The average breadth of British Columbia is about 250 miles, and the area, including Vancouver island and Queen Charlotte islands, is roughly estimated at 466,000 square miles.

The population by the last official census, 1891, was 98,173, composed of : Whites, 54,061 ; Indians, 35,202 ; Chinese, 8,910.

Vancouver island became a Crown colony in 1858, and was united to British Columbia (the mainland colony) as one colony under the name of British Columbia in 1866. Previous to 1858 the island had been for the most part in the hands of the Hudson's Bay Company, who held their lands in the island under a Royal Charter granted in the reign of Charles II.

Products.—British Columbia contains extensive tracts of arable land, and a large auriferous district. Gold was first discovered on Thompson river in 1858.

Wheat, barley, oats, potatoes, peas, vegetables, and fruits flourish in British Columbia. The fisheries are very rich, salmon is abundant, the export of which, chiefly in tins, constitutes one of the principal sources of wealth in the country ; it is also an important part of the food of the Indians. Houlican (Oolachan), a fish somewhat resembling the herring, cod, herring, halibut (of enormous size), sardines, anchovy, haddock, and oysters are also found.

The fur trade, which, until the year 1860 was entirely monopolised by the Hudson's Bay Company, is considerable. Among the numerous fur bearing animals the principal are the sea otter, marten, silver fox, black fox, and red fox.

The forests are of great extent, producing valuable timber, of which the Douglas pine (commonly called Oregon pine), white pine, maple, Scotch fir, and cedar are the principal; the Douglas pine, yielding spars 100 to 150 feet in length, and 2 feet in diameter, is exported in large cargoes. Besides the above, the yellow cypress, poplar, arbor-vitæ, yew, oak, arbutus, alder, dog-wood, cherry, crab-apple, willow, and cotton-wood are found. Cattle, horses, sheep, and other farm animals thrive generally in all parts.

STANDARD TIME of British Columbia is that of the meridian of 120° West from Greenwich.

COAL is found on the mainland and on Vancouver island; the mines at Nanaimo and Departure bay, which yield bituminous coal, being the principal places on the island. Anthracite coal is found in Queen Charlotte islands.

Bunker coals can be obtained (to order) at Esquimalt, Victoria, and Vancouver; also at Seattle, Tacoma, and Portland in Washington territory.

In 1896, the output of coal was 894,882 tons, of which 634,273 tons were exported.

Aborigines inhabiting the coast have great skill in the building and management of canoes; they are a polygamous race, and subsist chiefly by hunting and fishing; those of southern Columbia are dark, and wear their hair long, while those of the more northern districts are of a clearer tint. The coast Indians live in substantial one-story dwellings of axe-hewn timber, divided into several compartments, of which one is occupied by each family. Inland the houses or wigwams are made of skins, tent cloths, and mats; in severe weather they take shelter in underground houses (circular pits) from 20 to 40 feet in diameter, and 8 or 10 feet deep, covered over with a substantial earthed roof, with a 3-feet circular aperture in the centre, forming the only outlet for the inhabitants and smoke.

PILOTS.—There are no regular Pilots for the inner channels.

When approaching Juan de Fuca strait, a man competent to take ships to Royal roads or port Townshend can be obtained from the schooners engaged in the seal fishery off the coast, between cape Beale and Clayoquot sound, at from 5 to 20 miles from the land.

RESCUE STATIONS.—Depôts, with provisions and other necessities for ship-wrecked mariners, have been established in Juan de Fuca strait, at cape Beale lighthouse, in approximately lat. $48^{\circ} 47\frac{1}{2}'$ N., long. $125^{\circ} 13\frac{1}{2}'$ W. ; and Carmanah lighthouse, in approximately lat. $48^{\circ} 36\frac{3}{4}'$ N., long. $124^{\circ} 46\frac{1}{2}'$ W.

Notice boards have been erected at intervals between cape Beale and port San Juan (about 12 miles eastward of Carmanah lighthouse), giving information, for the use of ship-wrecked mariners, respecting the direction and distance of the nearest lighthouse, and also of the nearest Indian village where assistance can be obtained.

Cape Beale and Carmanah lighthouses are telegraph and signal stations.

DOCKS.—The graving dock at Esquimalt is 450 feet long over all, and 430 feet on the blocks ; 65 feet wide at the entrance, with a depth of $26\frac{1}{2}$ feet over the sill at high water ordinary spring tides. This dock is closed by a caisson which, if necessary, can be placed on the outer side of the outer invert, giving an additional length to the dock of 30 feet.

H.M.S. *Warspite*, drawing 26 feet, was docked on 18th July 1891, the depth on the sill that night was $28\frac{1}{2}$ feet. See tides, page 12.

The Admiralty have the right of priority of use of the Esquimalt dock. See page 79.

There is a patent slip at Esquimalt capable of taking up a ship of 2,500 tons ; there is also a patent slip at Victoria.

The United States Government dry dock at Port Orchard is 640 feet long over all, $573\frac{1}{2}$ on the blocks, $93\frac{3}{4}$ feet wide at the entrance ; has 30 feet over the sill, and $28\frac{1}{2}$ feet on the blocks. See page 47.

In connection with the workshops which are at Tacoma, a floating dock is moored, in 8 fathoms, in Quartermaster harbour on the north side of the channel. The dock, capable of receiving vessels of large tonnage, is 325 feet long, 100 feet broad, and 80 feet between side walls, lifting power 8,000 tons. Repairs can be effected. See page 56.

COMMUNICATIONS.—Steamers run daily from Vancouver town, Burrard inlet, to Victoria and Nanaimo ; weekly to San Francisco ; fortnightly to Portland, on the mainland (Oregon) ; and at irregular intervals to all points up and down the coast.

Also, regularly to Japan and China, every fortnight in summer and every four weeks in winter; and to Australia every month.

From Victoria, steamers run to Port Essington and Port Simpson fortnightly; also, regularly to Port Angeles, 18 miles distant; Port Townsend, 38 miles; Seattle, 100 miles; Tacoma, 128 miles; Vancouver, 72 miles; New Westminster, 73 miles; Nanaimo, 72 miles; and San Francisco, 750 miles (every 5 days). Steam vessels also run from Victoria to Alaska every fortnight throughout the year.

Railways.—The Canadian Pacific Railway crosses the heart of the British possessions in the North American continent, and is 3,054 statute miles in length between Quebec and Vancouver town in Burrard inlet, the western terminus; the distance being accomplished in about 5 days 22 hours, and trains leave daily from both places.

A branch runs from Vancouver town to English bay, and from Port Moody to New Westminster, thence it connects with Tacoma, Portland, San Francisco, and the whole of the American railway system.

There is a railway on Vancouver island, between Victoria, Esquimalt, and Nanaimo.

Telegraphs.—Esquimalt is in telegraphic communication with England through Canada, by way of Nanaimo and Burrard inlet. Also through the United States, by way of Seattle. Submarine electric cables cross Juan de Fuca strait from Clover point to New Dungeness; and the strait of Georgia from Valdes island to point Grey.

Exports and imports.—In 1896-97, the total value of the imports was \$7,130,381, and the exports \$14,184,708.

CLIMATE.—The climate of British Columbia varies considerably according to the locality; in the southern parts and on Vancouver island it is temperate during summer, the thermometer seldom rising on the hottest day above 80° Fahr., or falling below 20° Fahr. in winter; and it may, in fact, be said that this region possesses the climate of England without its humidity. In the central part of the province, however, the drought, heat, and cold are greater, the heat sometimes being very intense. It is, however, remarkably healthy both in summer and winter, there being no malaria or ague either

during the hottest weather or in the dampest localities. Generally speaking, the summers are dry at Vancouver island, but with occasional showers; the winters bring a good deal of rain, and snow falls more or less each year.

In the northern part of the province along the coast the atmosphere is excessively humid, and rain falls heavily.

The climate of the mainland coast opposite Vancouver island differs somewhat from that of the south-east portion of the island. In summer the temperature averages slightly higher, and in winter somewhat lower, while the rainfall is greater immediately along the coast.

The lower Fraser valley (New Westminster district) does not receive in summer the cold breezes from the Olympian mountains which blow across Victoria, nor does it receive in winter so much of the genial warmth of the ocean air. As a general thing, ice forms on the river for a short time and snow begins to fall in January, and continues to do so intermittently till March, the ground not being continuously covered with it.

At Esquimalt the highest summer temperature is about 72° Fahr. (in August), June, July, and August being the warmest months of the year. The lowest temperature is about 23½° Fahr., the coldest months being December, January, and February. The greatest daily range occurs in March, and the smallest in October.

The temperature on Vancouver island during summer is lower than on the mainland, owing to the prevailing south-east winds blowing from the snow-capped mountains on the American side and across Queen Charlotte sound. The waters of the sound are peculiarly cold at this season.

The barometric variations are neither great nor frequent, the range for the year averaging about 1.5 inches.

The climate at port Simpson is uncertain, no two seasons being the same, or appearing to follow any general law. During one summer fine weather may be experienced for six weeks at a time, and on such occasions a serene atmosphere, with magnificent sunsets, will be experienced. The following summer may prove one of almost constant rain, with a succession of gales from south-eastward.

Along the shores of Chatham sound the rainfall is not so great as within the inlets. The temperature during July and August 1892

varied from 62° to 48° . The mean temperature of the sea was 4° lower than the mean temperature of the atmosphere at port Simpson during these periods, but at Metlah Catlah and Nass bay it was 8° lower than the atmosphere, probably due to the influence of the cold water from the rivers which flow into those bays.

The navigator Vancouver in his voyages (1790-5) describes as follows: "In Portland canal the sun's rays in August, between 9 a.m. and 3 p.m., are very powerful, and, reflected from the snow, caused occasionally intense heat. When the sun is obscured by the mountains, the atmosphere at once convey a sensation of chilliness. During that month, just before sunrise, the thermometer often registers 32° Fahrenheit, water left in basins within a tent being frozen during the night. The vapour developed by the heat of the sun during the early portion of the day, becoming condensed on the mountainous shores of the inlet, usually falls as a drizzling rain from 3 p.m. to about midnight."

The climate of Queen Charlotte islands and the off-lying islands of the coast of British Columbia is influenced by the warm body of water which washes their shores, the winter is less severe and the climate is milder on the islands than within the inlets. The vapour arising from this body of warm water is condensed upon the high mountains which form the shores of the mainland, and falls in drizzling almost constant rain so prevalent in these waters.

Ice.—Fraser river is, as a rule, frozen over at New Westminster, from January to early in March, during which time sleighs run to Langley. The lakes in the vicinity are frozen over, and ice forms at the head of the several inlets where the water is comparatively fresh, but on the coast it does not form sufficiently thick to impede navigation.

Within the inlets on the coast, north of Vancouver island, ice is formed during the winter of from 8 to 12 inches in thickness, and occasionally extends as far as 25 miles from the heads of the inlets.

Skeena and Nass rivers are frozen over during the winter, the former as far as six miles below port Essington, and the latter, in severe weather, down to its mouth.

Rainfall.—The average annual rainfall appears to be about 55 inches; heavy rains generally occur in December and January.

Meteorological tables for places near the seaboard of British Columbia will be found at pages 550–552.

FOGS.—Juan de Fuca strait.—Although fogs in this region are not of such frequent occurrence as on the neighbouring coast of California (where they prevail almost uninterruptedly during summer, and as late as the middle of October), yet from August to November they occur in Juan de Fuca strait, and are sometimes very dense over the entrance for several days together. They are generally accompanied by calms or very light winds from north-west, which renders them the more dangerous to sailing-vessels closing the land.

Fog on the coast north of Vancouver island.—Fogs are prevalent especially during the summer months. The north-west winds which prevail during that season, condense the vapour which arises from the comparatively warm water surrounding Queen Charlotte islands and the coast of Alaska. During the prevalence of north-west winds this vapour is dispersed, but during calms or with light winds, and especially with south-westerly winds succeeding north-west winds, it approaches quickly from seaward in the form of dense fog, or drizzling mist and rain.

At times fog will be found at the entrances to the sounds during the forenoon, dispersing near noon by the heat of the sun, the afternoons becoming clear and fine.

Smokes from forest fires cause much inconvenience during the dry season, and are a great impediment to navigation. In some seasons they have extended from Georgia strait to Portland inlet.

FOG SIGNALS.—Caution.—Sound is conveyed in a very capricious way through the atmosphere. Apart from the wind, large areas of silence have been found in different directions and at different distances from the origin of the sound, even in clear weather. Therefore, too much confidence should not be felt in hearing a fog signal. The apparatus, moreover, for sounding the signal often requires some time before it is in readiness to act. A fog often creeps imperceptibly towards the land, and is not observed by the people at a lighthouse until it is upon them; whereas, a ship may have been for many hours in it, and approaching the land. In such a case no signal may be sounded. When sound has to travel against the wind, it may be thrown upwards; in such a case a man aloft might hear it when it is inaudible on deck.

WINDS.—Juan de Fuca strait.—Within Juan de Fuca strait, in the winter season, the winds usually assume its direction either up or down. During summer, the prevailing winds from N.W. or S.W. take a direction up the strait; while the S.E. gales of winter blow fairly out.

Although a westerly wind may be blowing within the strait, it frequently during the change of the seasons blows heavily outside at the same time from S.S.W., or sometimes suddenly changes to that direction from a light easterly wind on opening the entrance, which makes that part of the coast of Vancouver island (between port San Juan and Bonilla point) a dangerous lee-shore to a ship without steam power.

The coast winds in summer prevail from S.W. and N.W., the former during the early months, and the latter blowing fresh and with great regularity during June, July and August. In September and the early part of October the winds are very uncertain and there is generally a great deal of calm, gloomy weather.

The barometer usually stands above 30.00 inches during summer; should it fall to 29.90 a south-easterly wind with thick rainy weather may be expected, but of short duration, and clearing up with a westerly wind as soon as the barometer rises.

The winter winds are S.E. or S.W., more frequently the former; they set in towards the end of October, and continue until the middle of April. S.E. gales are generally preceded by a short interval of calm, cloudy weather; they spring up gradually from East or E.S.E. veering to the southward, accompanied by rain and thick weather, the barometer falling rapidly; when the barometer becomes stationary the wind shifts suddenly to S.W. and blows heavily with clear weather, but with frequent squalls of rain; the barometer begins to rise immediately the wind veers to S.W., from which quarter it generally blows from 12 to 20 hours.

The violence and duration of these S.E. gales is always proportioned to the fall of the mercury; with the barometer at 29.50 a strong gale may be looked for from this quarter; it seldom falls below 29.20, when very bad weather is certain to follow. On two or three occasions in as many years it has been known to fall to 28.90, and has been followed by S.E. gales of great violence.

A S.E. gale sometimes springs up, though very seldom, with the barometer above 30.00 inches. On such occasions the wind has always been preceded by calm, cloudy weather and rain, with a high

but falling barometer ; such gales are not violent and are of short duration.

S.E. gales are always accompanied by thick dirty weather, and rain ; but they seldom continue from that quarter for more than 12 or 18 hours, unless the barometer falls very low, and they almost always shift to S.W.

When the S.W. gale of winter is not preceded by one from S.E., the barometer seldom falls ; it either remains stationary, when the gale may be expected to continue longer, or rises slowly, when it will gradually subside and fine weather follow. S.W. gales are accompanied by heavy banks of clouds, with passing showers of rain, and sometimes snow.

The barometer has been known to fall during winter as low as 29.45, and has been followed by no gale or bad weather, but on such occasions there has been a heavy fall of snow on the hills, and a sudden fall of 15° in the temperature.

A fine northerly or N.E. wind frequently occurs at intervals during the months of December, January, and February ; it is always accompanied by a high barometer (above 30.0), and at such times a continuance for several days together of clear, cold, frosty weather may be looked for ; the barometer on these occasions will sometimes rise as high as 30.70, and the fine weather will then probably last a fortnight or more.

Winds in the strait of Georgia.—The prevailing summer wind in the strait of Georgia is from N.W., or the same as on the outside coast, and between May and September it blows strong and steady, commencing about 9 a.m. and dying away towards sunset. These winds do not generally extend much below Roberts point, among the Haro archipelago they become variable and baffling, while in the main channels of Rosario and Haro the westerly wind entering the strait of Fuca is deflected to S.W., and vessels running up these channels with a fair wind almost always find it ahead on entering the strait of Georgia. During winter there is a good deal of moderate, calm, and gloomy weather, but gales from S.E. and S.W. are frequent.

Winds on the coast north of Vancouver island.—The prevailing winds during the summer on the coast northward of Vancouver island are from the north-west, preceded during the earlier summer months by south-westerly winds.

During the winter months S.E. and S.W. winds prevail.

Gales from the S.E. prevail at all seasons, and are more frequent and severe than those experienced on the coast of Vancouver island. The summer gales are of shorter duration than those of winter, and seldom last more than 48 hours. At the fall of the year, gales from the S.E., lasting for 8 days, have been experienced.

The strength of the summer winds depends greatly upon local circumstances. Down the channels, which lie in a N.W. and S.E. direction, with high land on both shores, they frequently blow with great strength. The wind usually begins at sunrise, increases in strength throughout the day until about 3 p.m., and then gradually declines towards sunset. The nights, as a rule, are calm during the summer months; but, if the wind prevail but slightly from the N.W. during the night, it will probably blow hard from that quarter on the following day.

The barometer stands at about 30.10 during the prevalence of N.W. winds. Gales from the south-east are usually preceded by a falling barometer, but not invariably. A sensation of dampness in the atmosphere is the usual precursor, and the reading of the wet and dry bulbs, though as a rule not differing greatly upon this coast, more closely approximate each other.

If during the summer the barometer fall one-tenth of an inch, especially if it has been standing at higher than 30.20, a gale from the south-east is probable.

These gales usually begin at E.S.E., veering to the southward with a falling barometer; the wind remaining at S.E. and S.S.E. for a long or short period according to the season of the year. With a rising barometer the wind shifts to the S.W. with violent squalls, and then hauling more westerly blows itself out. A strong S.E. gale, of short duration, has been experienced, during the summer, with the barometer previously registering 30.17 and falling to 30.12.

Winds in Queen Charlotte islands.—South-east winds are prevalent, and are almost invariably accompanied with thick, rainy weather; those from the opposite quarter generally bring fine weather. The weather is uncertain, and cannot be depended on for 24 hours at a time.

The heaviest rainfall is local, taking place on the western mountains of Queen Charlotte islands. It may often be noted that while heavy rain is falling on the mountains the sky is comparatively

clear over the strait to the eastward. From this circumstance the north-east part of Graham island is not subject to a heavy rainfall. Snow occasionally falls in winter.

CURRENTS.—A south-easterly current has been found to prevail on the western coast of Vancouver island more or less throughout the year, particularly from August to November, probably in some measure caused by the N.W. winds which blow almost constantly on the coast during the summer. This current joining the ebb stream out of Fuca strait has been known to set vessels between 4 and 5 miles an hour to the south-eastward, and during fogs there is great risk of being drifted on to cape Flattery, or some of its off-lying dangers; extreme caution should, therefore, be observed when entering the strait at such times, especially near the full and change of the moon when the tidal streams are at their strongest.

With winds from the south-eastward in the offing, however, this southerly set has been checked, and near the coast a set to the northward experienced. In July, 1873, H.M.S. *Repulse* experienced a northerly set of one knot an hour and S.E. winds, at 300 miles from cape Flattery. H.M.S. *Heroine* in 1883 also experienced a current setting in the same direction.

Waterlogged vessels, laden with red wood from California, have frequently been found stranded on the beach between Barclay sound and Clayoquot sound.

In January 1874, a life buoy was lost 60 miles S.W. of cape Flattery, and in February of the same year, about six weeks later, the same life buoy was picked up on Masset beach, Queen Charlotte islands.

In 1875, the steamer *Pacific* was sunk in collision about 30 miles S.S.W. of cape Flattery, and a great deal of the wreckage was found in the neighbourhood of Barclay sound, while some of the bodies were picked up near Beacon hill, Victoria.

The currents are affected by the direction and force of the winds, and, as in winter, the prevailing wind is S.E. to S.W., the tendency is to produce a northerly set or current.

H.M.S. *Pheasant* (1891) experienced a N.W. set when returning to Esquimalt from the Bering sea.

It is reported by local pilots "that a current to N.W. is steady and well defined on the western coast of Washington and Vancouver island, and inside the current setting to the S.E. along the coast.

TIDES.—On the coasts and in the channels of British Columbia there are usually two unequal tides in the lunar day; the intermediate tide being generally of very small range in comparison with the larger tide; and sometimes disappearing altogether, then making only one tide in the lunar day.

The intermediate tide is sometimes nearly as high as the larger tide, with a fall of less than one foot between; sometimes as low as the larger tide, with only a small rise between; and again occurs midway between the higher high water or the lower low water; its general effect, thus being an apparent stand in the level of the sea surface for about 8 hours before or after high or low water, or midway between them.

The range of the tide is much affected by the moon's declination and parallax; the position for producing the greatest range being soon after the moon has passed its extreme north or south declination, and is at the same time near its greatest parallax; and for producing the least range, soon after it has passed the equator, and is at the same time near its lowest parallax; the general effect being that tides of the greatest range do not necessarily occur at a regular interval after new or full moon, but rather when the moon is in a favorable position with regard to its parallax and declination as given above.

On the western side of Vancouver island the tides are regular; flood and ebb of six hours duration, the times of high water on the full and change at Nootka sound, and at the entrance of Goletas channel, varying very little, and occurring near noon, the greatest range 13 feet.

TIDAL STREAMS.—The flood stream sets to the northward along the outer coast of the continent and Vancouver island. It enters Juan de Fuca strait at cape Flattery, running with considerable velocity, sometimes 3 or 4 knots, over Duncan and Duntze rocks; it then turns sharply into the strait, passing through the various channels among the Haro archipelago into the strait of Georgia, and between cape Mudge and cape Lazo at a distance of from 5 to 20 miles from the former. According to the phase of the moon and the state of the wind, it is met by a flood stream from the northward, which, sweeping the western coast of Vancouver island, enters Goletas channel and Queen Charlotte sound at its northern extreme, in lat. 51° N., thence southerly down the narrow waters of Johnstone strait and Discovery passage,

meeting the stream which enters by Juan de Fuca strait, and reaches about midway between the northern and southern extremes of Vancouver island, or close to the spot where the broad expanse of the strait of Georgia merges into the narrow channels adjoining it.

At cape Flattery the west-going stream commences to run strongly about 2 hours after high water, full and change; and continues for about 6 hours.

There is no marked irregularity observable in Johnstone strait and Discovery passage, except the not unusual circumstance that the ebb stream continues to run to the northward for 2 hours after it is low water by the shore, the water rising at the same time; the ebb stream being of 7 hours duration, the flood about 5 hours. For tides in Seymour narrows, *see* page 250.

The ebb stream has always been found to run southward through the Haro archipelago, and out of Fuca strait for $2\frac{1}{2}$ hours after it is low water by the shore, the water rising during that time; the ebb is stronger than the flood, and generally two hours longer duration.

Tidal streams in Strait of Georgia.—The tidal streams, although not nearly so strong as among the Haro archipelago, yet run with considerable strength, as much as 3 knots, particularly during the freshets of summer, when Fraser river discharges an immense volume of fresh water, which takes a southerly direction over the banks, and almost straight for the mouth of Active pass. The peculiar milk-coloured water is frequently carried quite across the strait, and is sometimes seen in the inner channels washing the shores of Vancouver island; at other times it reaches the centre of the channel only, forming a remarkable and most striking contrast with the deep blue waters of the strait of Georgia.

Tidal streams in Hecate strait.—In Hecate strait the flood stream comes from the southward. In Dixon entrance, the flood coming from the westward round North island, sets along the Masset shore, across Hecate strait for Brown passage, spreading for about 15 miles round Rose point towards cape Ibbetson (Edye passage), where it meets the flood from the southward; consequently between Rose point, cape Ball, cape Ibbetson, and thence south-east 15 or 20 miles, the streams are irregular.

The course and rate of the tidal streams are greatly influenced by the winds. At full and change they run with great strength. Time of high water over the strait generally is about 0h. 30m.

Between cape Murray, Percy point, and Zayas island the streams are strongest and most irregular, causing a heavy and confused sea, so much so, that in bad weather it has the appearance of breakers.

CANADIAN UNIFORM SYSTEM OF BUOYAGE.—

Throughout the ports of British Columbia all buoys on the starboard side of the channel, entering from seaward, are painted red, and, if numbered, marked with even numbers, and must be left on the starboard hand when passing in.

All buoys on the port side, entering from seaward are painted black, with odd numbers, if any, and must be left on the port hand when passing in.

Buoys painted with red and black horizontal bands will be found on obstructions or middle grounds, and may be left on either hand.

Buoys painted with white and black vertical stripes will be found in mid-channel, and must be passed close-to, to avoid danger.

All other distinguishing marks to buoys are in addition to the foregoing, and indicate particular spots; a detailed description of which is given when the mark is first established.

Perches with balls, cages, &c., will, when placed on buoys, be at turning points, the colour and number indicating on which side they are to be passed.

Spar buoys will in some cases be surmounted by a ball, which will invariably be painted red, and will indicate that it is a starboard buoy, and must be left on the starboard or right hand when entering a channel or harbour.

The rule for colouring buoys is equally applicable to beacons, spindles, and other day marks, so far as it may be practicable to carry it out.

In British Columbian waters the buoys are not withdrawn in winter.

UNITED STATES UNIFORM SYSTEM OF BUOYAGE.

—As a part of the United States is described in this work, it is mentioned that: the following uniform system of buoyage has been adopted for the coasts and harbours of the United States:—

Approaching from seaward—all buoys on the starboard side of a channel are painted red, and if numbered, marked with even numbers, and should be left on the starboard hand.

Approaching from seaward—all buoys on the port side of a channel are painted black, with odd numbers, and should be left on the port hand.

Buoys painted red and black, in horizontal stripes, mark obstructions, or middle grounds, and may be left on either hand.

Buoys painted white and black, in vertical stripes, mark mid-channel, and should be passed close to, to avoid danger.

All other distinguishing marks to buoys are in addition to the foregoing, and indicate particular spots; a description of which is as follows :—

Perches, with balls, cages, &c., will, when placed on buoys, be at turning points, the colour and number indicating on which hand they should be left.

Different channels in the same bay, sound, river, or harbour will be marked, as far as practicable, by different descriptions of buoys. Principal channels will be marked by nun buoys; secondary channels by can buoys; and minor channels by spar buoys. Where there is only one channel, nun buoys, properly coloured and numbered, are usually placed on the starboard side, and can buoys on the port side of the channel.

The rule for colouring buoys is applicable to beacons, and other day-marks, marking the sides of channels. In other places, beacons and day-marks will be constructed with special reference to the background before which they are seen.

UNITED STATES STORM SIGNALS. — A storm signal.—A red flag (8 feet square) with black centre (3 feet square) indicates that the storm is expected to be of marked violence.

A red pennant (5 feet hoist and 12 feet fly) displayed with the flags indicates easterly winds; that is, from north-east to south, inclusive, and that the storm centre is approaching. If the pennant is above the storm signal, winds from the north-east quadrant are expected; and if below, winds from south-east quadrant.

A white pennant (5 feet hoist and 12 feet fly) indicates westerly winds; that is, from north to south-west, inclusive, and that the storm centre has passed. If the pennant is above the storm signal, winds from north-west quadrant are expected; and if below, winds from south-west quadrant.

The information signal consists of a red pennant, and indicates that the displayman has received information of a storm covering a limited area, dangerous only for vessels about to sail to

certain points. The signal will serve as a notification to ship-masters that important information will be given them upon application to the displayman.

No night signals are displayed on the Pacific coast.

KELP will be seen on the surface of the water, growing on nearly every danger with a bottom of rock or stones, during the summer and autumn months; but during the winter and spring this useful marine plant is not always to be seen. It should be an invariable rule never to pass through kelp. In general, by keeping clear of kelp you keep clear of danger, but this must not prevent attention to the lead, as the rule sometimes fails; kelp is always a sign of danger, and unless the spot where it grows has been carefully sounded, it is not safe for a ship to pass over it. A heavy surge will occasionally tear the kelp away from rocks; and a moderate stream will ride it under water, when it will not be seen. When passing on the side of a patch of kelp, from which the stems stream away with the current, care should be taken to give it a wide berth, because the kelp showing with a strong tide is on one side of and not over the rocks. The least water will usually be found in a clear spot in the middle of a thick patch of fixed kelp.

It is perhaps well to point out that kelp not attached to rock floats on the water in heaps, whereas kelp attached to rocks streams away level with the surface, whilst the leaves give an occasional flap.

INNER PASSAGES.

CAUTION.—When navigating the inner waters of British Columbia, it should be constantly borne in mind that many of the main channels and most of the minor passages have only been roughly examined; detached boulders from the broken shores, and pinnacles of rock are still frequently found. Whenever, therefore, a broad and clear channel is known to exist, there is no justification in using, without necessity, one of more doubtful character, even if there be some saving in distance; and a ship should always be maintained in the safest possible position in a channel, as well as when going in or out of port.

VICTORIA to BURRARD INLET.—The best route from Victoria to Burrard inlet is south of Trial and Discovery islands,

through the main channel of Haro strait, and northward of Stuart and Waldron islands into the strait of Georgia. Only those with good local knowledge should attempt to navigate the inner channels.

VICTORIA to ALASKA.—From Victoria or Puget sound it is usual for vessels to pass through Haro strait and enter the strait of Georgia, eastward of Saturna island, or through Active pass (for steam-vessels). *See* Caution, on page 16.

Strait of Georgia to Queen Charlotte sound.—Steamers to Alaska usually coal at Departure bay or Nanaimo; it is usual to pass southward of Ballinac islands, and also the Sisters, from whence a course is shaped for Discovery passage, the only navigable channel from the gulf of Georgia to the north-west; vessels may have to wait for slack tide in Seymour narrows, for which Menzies bay to the southward of the narrows, and Plumper bay to the northward, will be found convenient anchorages.*

Proceed mid-channel through Johnstone passage; there is a clear channel both northward and southward of Helmcken island; the latter, named Race channel, is that generally used.

When navigating Broughton strait do not pass more than 2 cables southward of Cormorant island to clear Nimpkish bank, and the south-western coast of Haddington island should be rounded within half a mile to avoid the reef off Ledge point, and care should be taken when rounding Pulteney point, the west extreme of Malcolm island, off which foul ground extends more than one mile. From Broughton sound to Queen Charlotte sound either Goletas or New channel may be selected.

From Queen Charlotte sound to Dixon entrance the route usually adopted in steam-ships is by way of Fitzhugh sound, Lama passage, Seaforth channel, Milbank sound, Finlayson and Grenville channels, and Chatham sound. The passage to Fitzhugh sound is between the dangerous Sea Otter group on the west and the rocks off the entrance to Smith sound, about lat. 51° 20' N. Those from the westward enter by North passage between Sea Otter group and Calvert island. Westerly gales send in a heavy swell, and dense fogs are of frequent occurrence in this vicinity, that too great care cannot be taken in the navigation.†

Fitzhugh sound is about 40 miles long, averages about 3 miles wide, and has deep water. When passing from Seaforth channel to

* *See* chart, No. 1,917.

† *See* charts, Nos. 1,923a and b.

Milbank sound it is usual to pass three-quarters of a mile northward of White rocks.

Finlayson channel is about 24 miles long, 2 miles wide, and has deep water ; Hiekish narrows are $2\frac{1}{2}$ cables wide in the narrowest part. When nearing Hewitt rock keep the northern shore aboard. Grenville channel is reached through Campania sound, by Squally or Whale channel, lat. $53^{\circ} 20'$ N. Except when bound up Skeena river the passage south of Gibson channel island is preferable, thence by Arthur passage to Chatham sound and to Dixon entrance and Port Simpson.

Dixon entrance to Cross sound.—The main channels at present used, and touching at the various points of the Alaska territory, are by the inland passages, as follows :—

Touching first at Tongass the route then follows the Revillagigedo channel, through Tongass narrows to Clarence strait, and by Stikine strait to Port Wrangell, making detours to visit Port Chester and the various fishing stations. From Port Wrangell the route continues through Wrangell strait (which, with local knowledge, is navigable by vessels drawing 10 feet at low water, it is well buoyed, but the navigation is difficult), through Frederick sound and Stephens passage to Juneau and Douglas, in Gastineau channel ; thence again by Stephens passage to the west end of Douglas island ; if bound to the head of Lynn canal pass up Favorite channel.*

If bound to Sitka pass through Saginaw channel, down Chatham strait, and by Peril strait (the latter on no account without a pilot). Vessels sometimes pass out by Summer strait, round cape Decision (lat. $56^{\circ} 0'$ N.), and up Chatham strait, or continue outside directly to Sitka, or other outside ports.

OCEAN PASSAGES.

VANCOUVER and YOKOHAMA.—Full-powered steam-vessels.—The tracks recommended are as follows :—

From Vancouver to Yokohama, during summer months ; from Juan de Fuca strait steer to cross the meridian of 140° W. in lat. 51° N., keeping on that parallel to the 170th meridian, thence steering to cross 160° E. in lat. 48° N., 150° E. in lat. $43\frac{1}{2}^{\circ}$ N., and to make the coast of Japan at Kinkuwasan light in about lat. $38^{\circ} 20'$ N.

During winter months the same track to the 160th meridian east, thence steering to cross 150° E. in lat. $44\frac{1}{2}^{\circ}$ N., passing about 50 miles

* See chart, No. 2,481.

south-eastward of Shikotan (Skotan), and to make the coast of Japan as before at Kinkuwasan light. These routes are usually northward of the westerly winds, and in the track of the cold westerly current throughout.

From Yokohama to Vancouver, at all seasons, cross the meridian of 150° E. in lat. 40° N., 160° E. in $41\frac{1}{2}^{\circ}$ N., 170° E. in $47\frac{1}{2}^{\circ}$ N., and the 180th meridian in lat. 49° N.; thence keeping on that parallel to 140° W., and from there steering for the entrance of Juan de Fuca strait. This route is usually in a warm easterly current throughout.

VANCOUVER to VALPARAISO. — Full-powered steam routes.—Direct. Distances:—From Esquimalt to Callao, 4,750 miles; to Valparaíso, 5,910 miles. From San Francisco to Callao, 3,930 miles; to Valparaíso, 5,150 miles.

Sail or auxiliary steam.—In winter S.E. and S.W. winds prevail on the coast of California as far south as about lat. 25° N. and those bound from Vancouver island to Valparaíso at that season should stand down the coast, keeping at about 100 miles from it until near the latitude of San Francisco, and thence gradually edge to the westward so as to pass westward of and in sight of Guadalupe island, where in all probability the north-east trade wind will be met with; then steer to sight Clipperton island, passing westward of it; and in about this latitude the north-east trade wind will be lost.

If steam power is available the belt of variable winds and calms, which at this season on the meridian of 120° is 250 to 350 miles wide, should be crossed on a southerly course so as to pick up the northern edge of the south-east trade winds in about long. 110° W. (well to windward); but if depending on sail alone a vessel will probably not be able to cross the equator much to windward of long. 118° W., and every effort should be made not to cross further than that to the westward, as the result would be that the vessel would not weather Elizabeth or Pitcairn islands, in the vicinity of which light baffling winds from South to S.E. would be experienced.

The S.E. trade wind at this time of the year will in all probability be met with between lat. 5° N. and 3° N. The higher latitude during the early winter months (November and December), and the lower latitude towards March, when the ship should be kept full, making, as nearly as the wind will permit, a due South (true) course.

See chart, No. 2,683.

In about lat. 6° S. the trade wind generally becomes more easterly in direction, sometimes hauling as far round as E. by N. Cross the 20th parallel (S.) in long. 120° or 121° W. in order to pass well to windward of Ducie island, and standing to the south-east cross the meridian of Easter island in about lat. 33° S. and the 100th meridian in lat. 36° S. Calms and variable winds will be experienced in the vicinity of the 30th parallel settling into the north-west quarter as the vessel gets more to the southward, and on this account the 100th meridian should never be crossed northward of lat. 36° S. The 40th parallel should be reached before making easting, thence steer to pass southward of Juan Fernandez and on to Valparaiso.

In November 1872, H.M.S. *Scylla* went to the parallel of 41° S. before making easting, accomplishing a good passage of 46 days.

In summer.—In summer a course further west may be pursued, passing the latitude of San Francisco in about 130° W. Thence a sailing-vessel should be kept further from the land to avoid the calms and light variable winds experienced at this season along the coast of lower California and in the bay of Panama. After meeting the north-east trade wind in about lat. 30° N. stand to the southward, making a south (true) course on the meridian of 125° W. not only to avoid the calms above mentioned, but also the hurricanes which during August and September are liable to be met with eastward of that meridian. Occasionally, but rarely, these are met with west of long. 125° W.

The north-east trade wind will be lost at this season in lat. 11° or 12° N., and the belt of doldrums will be found to be not so wide as during the winter months. The south-east trade wind will at this season be met with in about lat. 8° N., and if, as is most likely to be the case at the commencement, the wind be well to the southward, stand to the eastward in order to recover some of the ground lost by keeping further to the westward in the north-east trades. Endeavour to cross the equator in from long. 118° to 120° W., and soon after crossing, the wind will haul more to the eastward, when stand to the southward to weather Ducie island, and reach the 40th parallel before making easting, so as to fall in with the north-westerly winds, as calms and variable winds are met with north of that parallel. After passing the meridian of 90° W. haul up for Juan Fernandez and thence for Valparaiso.

VALPARAISO to VANCOUVER.—Full-powered steam routes.—Direct.

See chart, No. 2,683.

Sail and auxiliary steam.—The best route to pursue when making this voyage is the same at all times of the year. Leaving Valparaiso stand to the north-westward passing to the eastward of St. Felix, and crossing the 17th parallel in long. 90° W. After falling in with the south-east trade wind steer to cross the equator in about 118° W. After falling in with the north-east trade wind steer to cross the 20th parallel in long. 137° W. and the 30th parallel in long. 140° W. Thence edge away to the eastward, crossing the 40th parallel in long. 138° W., and make for lat. 47° N., long. 130° W., before steering direct for Juan de Fuca strait. (Distance by this route 7,350 miles.).

In May and June the north-east trade wind is often very weak north of the 20th parallel, and frequently a belt of calm exists between the 20th and 30th parallels.

PANAMA to VANCOUVER ISLAND.—Steam routes.—Direct. Along the Californian coast and to the northward, steamers should follow the coast from point to point, as nearly as possible, always keeping within 15 miles of the land. By this means the strong north-west wind will frequently be avoided, as calms will often be found close in with the shore when there is a wind to seaward

Auxiliary steam.—Vessels with auxiliary steam power bound from Panama to Vancouver island should stretch off on a W. by N. (true) course (or, until the parallel of 12° N. is gained, a little more northerly), passing the meridian of Acapulco in about lat. 13° N. The eastern limit of the north-east trade wind is uncertain, but it will generally be met with in about long. 103° W., *i.e.*, at about 300 miles from the land. When first falling in with it the W. by N. course should be maintained, as by steering more to the northward the trade wind will be found to hang to the north and north-west. The meridian of 110° W. should be crossed in lat. 14° N., after which steer to cross the 130th meridian in about lat. 30° N., when steer northward as far as lat. 40° N., or until the westerly winds are reached, and thence gradually edge away for the port.

Sailing.—A vessel unaided by steam power will experience considerable difficulty and delay in getting out of the bay of Panama, owing to the light baffling winds and calms which are met with there at all seasons. Between October and April the prevailing wind in the gulf is from the northward; for the remainder of the

year the wind hangs more to the westward, and land and sea breezes are felt varied by calms and occasional squalls from south-west. Northward of lat. 5° N., between the 80th and 110th meridians, is a region of calms and light winds varied by squalls of wind and rain; but southward of lat. 5° N., between the coast of the mainland and the Galapagos islands, west of the meridian of 80° W., the wind is between South and West all the year round, and, except between the months of February and June, is fairly strong.

A vessel should, therefore, at all seasons make the best of her way to the southward, keeping as nearly as possible on the meridian of 80° W. until lat. 5° N. is reached, when, if the wind will allow, make a south-west course. Should the wind be westward of S.W. stand to the southward, but if southward of S.W. stand to the westward, and should the wind be light and variable with rain make every endeavour to get to the southward. When lat. 2° N. is reached, a vessel may, between June and January, stand to the westward carrying S.W. winds as far as 85° W., after which the wind will haul to the southward and south-eastward settling into the south-east trade wind.

Pass northward of the Galapagos islands, keeping on the parallel of 2° N. until the meridian of 105° W. is reached, when edge away to pass westward of Clipperton island, in the neighbourhood of which the north-east trade wind will be met with, when stand to the north-west to cross the parallel of 20° N. in long. 120° W., after which pursue the same course as if bound from Valparaiso. (See page 20.)

Between January and April, however, it is better to cross the equator between the Galapagos islands and the mainland before standing to the westward. Southward of lat. 1° N. the wind will be found to haul to the eastward as the vessel leaves the coast. At this season vessels should keep to the southward of the equator until westward of long. 105° W., when proceed as before directed.

VANCOUVER to PANAMA.—Full-powered steam.—Direct.

Sailing.—Sailing vessels making this passage between the months of December and May, inclusive, when the prevailing winds on the west coast of Mexico are from the northward, and the current favourable, should stand down the coast of California, keeping about 100 miles off, and at about 150 miles off the coast of Mexico, shaping a course to make the island of Hicaron, about 50 miles

westward from Mariato point, which is a good landfall for vessels bound to Panama from the westward.

Between the months of June and November, inclusive, when calms, variable winds, and oftentimes hurricanes prevail on the west coast of Mexico, sailing vessels should stand well out to sea after passing San Francisco, shaping a course to cross the equator in about long. 104° W., thence standing on to the southward, until sure of reaching Panama on the other (starboard) tack.

SOUTH-EASTERN AUSTRALIA TO VANCOUVER ISLAND AND SAN FRANCISCO AND BACK.—Full-powered steam routes.—Direct as possible, passing south-eastward of New Caledonia, and calling at Fiji and Honolulu for coal, if necessary. Distances:—Sydney to Fiji, 1,730 miles; Fiji to Honolulu, 2,760 miles; Honolulu to Esquimalt, 2,340 miles; and Honolulu to San Francisco, 2,090 miles.

The route back is the reverse of the above.

Sail and auxiliary steam routes.—Pass north or south of New Zealand, or through Cook strait, according to the direction of the wind on leaving, preferably through Cook strait, if from Sydney or Bass strait, but south of New Zealand if passing south of Tasmania. Thence proceed as from New Zealand.

On the route back, stand to the south-westward into the N.E. trade, and thence proceed as direct as possible, crossing the equator in about 170° W., and passing westward of the Fiji islands and south-eastward of New Caledonia.

See chart, No. 2,683.

CHAPTER II.

JUAN DE FUCA AND HARO STRAITS.

WITH ADMIRALTY INLET.—PUGET SOUND.—ESQUIMALT HARBOUR.
—VICTORIA HARBOUR.—INNER CHANNELS.—DIRECTIONS.

VARIATION, $22\frac{1}{2}^{\circ}$ East in 1898.

JUAN DE FUCA STRAIT, formed between the south coast of Vancouver island and the mainland of Washington territory, has its entrance between the parallels of $48^{\circ} 23' N.$ and $48^{\circ} 36' N.$, and on the meridian of $124^{\circ} 45' W.$; it is liable to all those sudden vicissitudes of weather common to high northern latitudes; and in few parts of the world is the caution and vigilance of the navigator more called into action than when entering it.*

The breadth of the strait between cape Flattery, its southern point of entrance, and Bonilla point on Vancouver island (its northern), is 13 miles; within these points it has a breadth averaging 12 miles in an Easterly direction for 60 miles.

At its eastern part are channels leading northwards to the British possessions, and among the Haro archipelago, and southward to those of the United States, by Admiralty inlet and Puget sound.

The strait in the centre is of great depth, but within $1\frac{1}{2}$ miles of either shore there is, generally, under 40 fathoms, and on the northern side, when 5 miles eastward of port San Juan, 8 to 12 fathoms will be found within one mile of the shore. On both sides of the strait, are several anchorages or stopping places which may be taken advantage of by those meeting with adverse winds; those on the southern side, before reaching the harbours of Admiralty inlet, are Neéah and Callam bays, Port Angeles, New Dungeness bay, Washington harbour, and port Discovery; on the northern side, westward of the Race islands, are Port San Juan, Sooke inlet, and Becher bay, eastward of which, excellent anchorage may be always obtained during westerly winds.

On the northern, or Vancouver island shore, the hills rise gradually and are densely wooded, but near the coast attain to no great

* See Admiralty charts:—Vancouver island and adjacent shores of British Columbia, No. 1,917, scale, $m = 0.15$ of an inch; and Juan de Fuca strait, No. 1,911, scale, $m = 0.29$ of an inch.

elevation ; on the southern side are the almost perpetually snow-clad mountains, known as the Olympian range.

RESCUE STATIONS.—Depôts, with provisions and other necessities for ship-wrecked Mariners, have been established at cape Beale lighthouse, and Carmanah lighthouse. These two lighthouses are telegraph and signal stations.

Notice boards have been erected at intervals between cape Beale and Port San Juan (about 12 miles eastward of Carmanah lighthouse), giving information, for the use of ship-wrecked Mariners, respecting the direction and distance of the nearest lighthouse, and also of the nearest Indian village where assistance can be obtained.—*See also* page 3.

The **COAST** southward from cape Flattery trends S.S.E. for 25 miles, the land being mountainous and thickly wooded. At the distance of 11 miles are the Flattery rocks, a group of remarkable, bare, rugged islets, the outer rock lying $2\frac{1}{2}$ miles from the shore.*

At 12 miles from them in the same direction is a remarkable square white rock, nearly one mile from the shore, which, when the sun's rays are reflected from it, is particularly conspicuous.

UMATILLA REEF LIGHT-VESSEL is moored in 25 fathoms, about $2\frac{1}{2}$ miles, S.W. $\frac{1}{4}$ S., from Umatilla reef, and shows *two, dioptric electric, fixed white* lights, one from each masthead, each elevated 55 feet above the sea, and visible in clear weather from a distance of 13 miles.

The light-vessel is schooner-rigged, with two masts and no bowsprit, a funnel and fog-signal apparatus between the masts, and a white circular gallery at each masthead under the lantern. The hull is painted red, with *Umatilla reef* in large black letters on each side, and 67 in black figures on each bow and quarter.

Should the electric apparatus be out of order the light-vessel will still show *two fixed white* lights, but of less power than the electric lights.

Fog signal is a steam whistle, which gives a blast *every thirty seconds*, thus :—blast, *three seconds* ; silence, *twenty-seven seconds*.

DESTRUCTION ISLAND is $1\frac{1}{2}$ miles long, narrow, and lies nearly parallel with the coast at one mile from it. It has steep white cliffy coast, is over 100 feet high, and covered with grass, but no trees ; in the channel between it and the shore is a depth of 12 fathoms.

* *See* Admiralty chart :—Cape Mendocino to Vancouver island, No. 2,531 ; scale $m = 0.07$ of an inch.

LIGHT.—Destruction island light is a *flashing white* light, showing a *flash every ten seconds*, elevated 144 feet above high water, and should be visible in clear weather 18 miles.

The lighthouse consists of a conical iron tower, 80 feet high, and painted white, upper part black ; with two dwellings about 180 yards in a north-east direction, and the fog signal building about 43 yards in a north-west direction, from it ; the dwellings and fog signal buildings are painted white, with brown roofs.

The fog signal is a steam siren, which, during thick or foggy weather, gives blasts of *five seconds* duration, with intervals of *fifty-five seconds* between the blasts.

CAUTION.—As previously mentioned on page 16, seamen are again cautioned that when navigating the Inner waters of British Columbia, it should be constantly borne in mind that many of the main channels and most of the minor passages have only been roughly examined ; detached boulders from the broken shores, and pinnacles of rock are still frequently found. Whenever, therefore, a broad and clear channel is known to exist, there is no justification in using, without necessity, one of more doubtful character, even if there be some saving in distance ; and a ship should always be maintained in the safest possible position in a channel, as well as when going in or out of port.

SOUTHERN SHORE OF JUAN DE FUCA STRAIT.

CAPE FLATTERY, or Classet, is a remarkable point of land, and in clear weather distinctly seen 35 miles, rising gradually from the sea to a thickly wooded mountain nearly 2,000 feet high, with an irregular shaped summit, and falling again 3 or 4 miles eastward. When seen from the southward or south-west it has the appearance of an island, being separated by low land from hills of the same or greater elevation, which rise again immediately southward of it.*

Flattery was the name given to this cape by Cook in 1788 ; but Vancouver, in 1792, says it was known to the natives by the name of Classet.

On a nearer view, the headland itself, with off-lying rocks over which the sea is almost constantly breaking, presents an uninviting

* See Admiralty chart, No. 1,911, also plan of Duncan rock and cape Flattery on Admiralty chart, No. 2,531 ; scale, $m = 2$ inches.

appearance; it is a rugged sea-worn cliff of no great elevation, rising gradually to its more prominent feature, a densely wooded mountain. From the cape the coast trends eastward for 4 miles to Neéah bay, and there is generally a heavy swell and irregular tides.

Tug.—See page 184.

LIGHTS.—Tatoosh island, lying half a mile N.W. from cape Flattery, is an almost perpendicular rocky islet, bare of trees, and 100 feet high, with some reefs extending a short distance off its western side; the lighthouse, known to seamen as cape Flattery light, stands on the summit of the island.

From the above lighthouse (which consists of a keeper's dwelling of stone, with a white tower rising above it, surmounted by an iron lantern painted black, its height being 64 feet), is exhibited a *fixed white* light, elevated 162 feet above the sea, and in clear weather should be seen 19 miles.

A sector of *red* light of 7° is shown between the bearings S. 39° E. and S. 32° E., covering Duncan and Duntze rocks.

The light is obscured over the land from S. 73° W. to N. 15° W., but eastward of Chibadehl rocks it is not visible west of S. 68° W.

Fog signal.—A steam fog whistle is sounded for *eight seconds*, at intervals of *fifty-two seconds*, during thick weather.

Telegraph and signal station.—Vessels can communicate by the International code of signals, and the station is connected by telegraph with Port Townsend.

Position.—Lat. 48° 23' 15" N., long. 124° 44' 10" W.

Cape Beale light.—See page 315.

Carmanah light.—See page 313.

Swiftsure bank, with a depth of 13 fathoms, is reported to exist in a position situated about 14½ miles N.W. by W. ¾ W. from cape Flattery lighthouse. H.M.S. *Swiftsure* in 1889 obtained a sounding of 20 fathoms in this vicinity, but the position is doubtful. Natives state that shoaler water exists.

Duncan rock lies one mile N.W. ¾ N. from Tatoosh island; it is a few feet above water, but the sea always breaks over it. There is deep water between it and the island, but do not take the passage,

unless carried by the tidal streams into such a position as would cause danger in endeavouring to avoid it. A shoal of 4 fathoms lies south-eastward of Duncan rock with Tatoosh island lighthouse S. by E. $\frac{1}{2}$ E., distant $7\frac{1}{4}$ cables, and Duncan rock W. by N. $\frac{3}{4}$ N.

Duntze rock, on which is a depth of 3 fathoms, lies about a quarter of a mile N.W. from Duncan rock, and the sea frequently breaks on it. The cross sea which is created in this neighbourhood during bad weather strongly resembles heavy breakers, extending a considerable distance across the strait.

Directions.—Those from the southward or westward bound for Juan de Fuca strait, except the coasting steam-vessels which all carry pilots, should make cape Flattery; there is no inducement to hug the coast, on which a long rolling swell frequently sets, and this swell meeting the south-easterly gales of winter, causes a confused sea.

The cape and its off-lying rocks should not be approached within a distance of at least 3 miles, as the tidal stream occasionally sets over Duncan and Duntze rocks with great velocity (page 12); the currents should also be guarded against (page 11), an additional reason why these dangers should not be too closely approached.

It is equally necessary when either entering or leaving the strait to avoid the coast of Vancouver island between port San Juan and Bonilla point, when there is any appearance of bad weather.

It is recommended to pass at the distance of at least 10 miles from the coast of the mainland southward of cape Flattery, unless working to windward against a fine northerly wind, which is frequently found during summer, when it may be safely approached, but not closer than 3 miles.

When nearing the strait at night, or in thick weather, be certain of the latitude; and as rocks lie some distance off the coast southward of cape Flattery, and it is therefore dangerous to approach, it is safer to be in error to the northward than to the southward. The coast of Vancouver is comparatively bold, the bank of soundings extends a considerable distance from the land, and the light on cape Beale is visible 19 miles. The current that is usually found setting across the entrance of the strait to the south-east should be particularly guarded against. See page 11.

When making the strait in bad weather it will be more desirable to run in and seek shelter than to remain outside. If the land has been made either to the southward of cape Flattery or on the Vancouver island shore within a moderate distance of the entrance, or if the latitude can be relied upon within 2 or 3 miles, it will be advisable to run for the strait. The powerful light on Tatoosh island will, unless in very thick weather, or fog, be seen, and as soon as a vessel is actually within the strait there is comparatively smooth water, with sufficient sea room, then run boldly up the centre for Race light, or if preferred, by the assistance of that on Tatoosh island, maintain position in the strait.

When Tatoosh island light bears westward of W.S.W., it is obscured by the land about Neéah bay, and Race island light is obscured by Beechey head bearing eastward of E. by N. ; therefore, when either of these lights are obscured by the land before mentioned, the distance from either coast will be accurately judged, and in the latter case a ship will be getting too close to the northern shore.

When intending to go outside the Race islands, pass the land about Beechey head at the distance of 2 miles.

Steam-vessels taking Race passage pass Church point at the distance of about half a mile, and keep the land aboard about that distance until up with Bentinek island, when the latter should be closed and kept within a quarter of a mile, or just outside the kelp.

The passage between Bentinek island and the Vancouver coast is choked with rocks, and strong tidal streams set through.

Coming from the westward with a heavy westerly or north-west gale, thick weather, and uncertain of the latitude, it would be prudent to "lie to" at not less than 30 miles from the entrance of the strait, or on the edge of the bank of soundings. These gales seldom last more than 12 hours, and if they shift towards the south-west the weather will clear, when bear up for the strait.

With a south-east gale it is recommended to close the land, as smoother water will be obtained, and the bank of soundings off the Vancouver island shore will indicate pretty accurately the distance from the land. Gales from this quarter sometimes continue in the winter season for 30 hours, and after striking soundings on the edge of the bank in 90 fathoms, and carried them into 60, put her head S.W., and there will be plenty of room for drift.

It is of great importance when making the strait during bad weather to strike the outer edge of the bank of soundings, as the ship's distance from the land will then be accurately known. After running 20 miles eastward the depth increases from 55 to 80 and 90 fathoms, which latter depths, if the lead has not been previously kept going, might be mistaken for the outer edge of the bank.

In a sailing-vessel and one of those dense fogs which sometimes hang over the entrance of the strait (page 7), do not close the land, but stand off sufficiently far to avoid being set by the southerly current too near cape Flattery.

If in a steamer and, having made the land or light on Tatoosh island, and certain of the position, get the northern or Vancouver island shore aboard, when, with the assistance of the chart and lead, feel the way in.

When 8 or 10 miles eastward of Port San Juan there is anchoring ground in 12 fathoms one mile from the shore, and if the fog is very dense a stranger should anchor; it must be remarked, however, that not unfrequently the weather is clear a few miles within the strait while the entrance is totally obscured.

NEÉAH BAY is formed between Koitlah point and Weaddah island; the latter, half a mile long in a N.W. and S.E. direction, is narrow and covered with pine trees. Koitlah point is 4 miles E.N.E. from the lighthouse on Tatoosh island. The bay offers a safe and convenient anchorage to those meeting S.W. or S.E. gales at the entrance of the strait, and is sheltered from W. by S. round by south to N.E. The western shore is steep and cliffy, but a reef extends more than one cable off Koitlah point, and a sand-bank which dries, extends off a quarter of a mile from the shore abreast the cliffs. The head of the bay is a low sandy beach, on which the surf generally breaks. On the eastern side of the bay off the south-west side of Waaddah island, a rocky ledge and shoal water extends 3 cables, and the holding ground is not so good on the island side.*

Light.—A fixed white lantern light is shown from a white post on Baaddah (Mee na) point, 16 feet above high water.

Whistle buoy.—A buoy, painted red, with N. B. on it in white letters, and fitted with an automatic whistle, is moored in about 22 fathoms at the entrance of Neéah bay, with the north end of

* See Admiralty plan of Neéah bay, scale $m = 2.0$ inches, on chart, No. 1,911.

Waaddah island S.E., 4 cables, and Koitlah point, S.W. by W.; the tidal streams set strongly past the buoy.

Anchorage.—A good berth will be found in Neéah bay, in 6 fathoms sandy bottom, with the outer point of Waaddah island bearing N.E. by N., and Koitlah point W. by N.; a short distance within this position kelp grows in large patches all over the bay, and some care is necessary in selecting a berth. Large sailing-vessels may anchor in 7 or 8 fathoms a little outside the above bearings, in the centre of the bay, with the outer point of the island bearing N.E. by E.

Sailing-vessels, during gales from south-west or west, "lie to" under the south shore of the strait inside Neéah bay, in preference to anchoring in Neéah bay.

Directions.—Leave this bay on any indication of a north-west wind; if too late, and unable to weather Waaddah island, run between it and the main with the assistance of the chart; the passage is $1\frac{1}{2}$ cables wide, and the least water 21 feet; be careful to avoid the ledge off the south-west end of Waaddah, and in hauling out give the eastern side of that island a berth of at least a quarter of a mile.

Vessels have ridden out north-west gales close to the south-east end of Waaddah in 6 fathoms, but it is more prudent to get out into the strait at the commencement of the gale. During strong westerly or south-west gales, or after they have been blowing outside, a considerable swell rolls into the bay, which renders it at such times a somewhat disagreeable though not unsafe anchorage; small vessels may go close in and get smooth water, even among the kelp which grows in 4 and 5 fathoms.

A life-saving apparatus has been established in Neéah bay.

Tides.—It is high water at full and change in Neéah bay at 0h. 33m.; springs rise $7\frac{1}{2}$ feet, neaps rise $6\frac{1}{4}$ feet.

CALLAM BAY is 15 miles E. $\frac{1}{2}$ S. from Neéah bay, the intervening coast being nearly straight, and the shore bold. The only remarkable feature is Klahosloh (Seal rock), 150 feet high, lying a short distance off shore at 2 miles eastward of Waaddah island. If there is an easterly or south-east wind, there is temporary anchorage and shelter in the centre of the bay in from 8 to 10 fathoms. Callam

bay is easily recognised by Slip point, its eastern bluff, which is the western termination of a bold coast ridge, about 1,000 feet high.

The COAST from Callam bay continues in an easterly direction for 8 miles to Pillar point, so called from its terminating in a bare columnar-shaped rock, somewhat remarkable, from its contrast to the general characteristics of the country (thickly wooded from summit to water line), where few objects present themselves by which seamen may accurately fix their positions. The coast on the eastern side of this point forms a small bight, in which there is a considerable stream and an Indian village, and then trends E. by N. for 17 miles to Striped peak; a small river, the Lyre, enters the strait just eastward of Low point, 7 miles westward from the peak.

Striped peak is rather remarkable from a landslip occurring down its face; at $1\frac{1}{2}$ miles westward from the peak, and one-third of a mile off the west point of Crescent bay (merely an indentation) lies a rock with 15 feet over it, and on which the sea breaks at low water. This rock is marked by a red nun buoy.

FRESHWATER BAY, at 3 miles eastward from Striped peak, between Observatory and Angeles points, is nearly one mile deep, and more than 2 miles wide, in an east and west direction, and the depth varies from 6 to 12 fathoms. Observatory point has several rocks extending a short distance off it; the western side of the bay is a high bold shore. Angeles point, the eastern entrance point, is low; the river Elwha flowing through it, forms a delta, and has caused a bank with a depth of water on it varying from 2 fathoms close in shore, to 10 fathoms at the distance of one mile. There is anchorage within the line of the points in from 6 to 9 fathoms.

PORT ANGELES is 7 miles eastward from the eastern point of Freshwater bay, the intervening coast forming rather a deep indentation to the southward, off which as little as 3 fathoms is found nearly one mile from the shore.

The north side of the port is bounded by one of those low narrow sand or shingle spits which are a characteristic feature of the country; this spit, which is named Ediz hook or False Dungeness, is covered with coarse grass, and the sea sometimes washes over it. It curves from a high bluff in an E.N.E. direction for nearly 3 miles, and forms a large and good harbour. At 2 miles from the shore 14 fathoms will be found N.N.W. from that part of the spit which joins the mainland; at night do not go within this depth.

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On the north, or spit side, the water is deep, varying from 15 to 30 fathoms; but southward of a line drawn through the centre there is excellent anchorage in from 7 to 10 fathoms in any part of the port. The outer or eastern end of the spit is steep-to, and may be rounded close to, after which the port extends for $2\frac{1}{2}$ miles in a westerly direction, by more than one mile in breadth. Although open to easterly winds, they do not blow home.

On the southern shore is the town Port Angeles, where a wharf extends 700 feet into the bay, with a T-head 100 feet long, and a depth of $16\frac{1}{2}$ feet at the end. There are other wharves, alongside of one of which the depth is 22 feet.

Fresh water is to be obtained from streams on the south side of the port.

LIGHT.—Ediz hook.—From a square white lighthouse, situated at about 80 feet from the extremity of Ediz hook, is exhibited, at 42 feet above the sea, a *fixed white* light, visible in clear weather 12 miles. The lantern is painted black.

Fog signal.—During thick or foggy weather, a bell is sounded *once*, at intervals of *fifteen seconds*, from a position 108 yards N.W. by N. from Ediz hook lighthouse.

Storm and weather signals are shown at Port Angeles. *See* page 15.

Tide.—It is high water, full and change, at 1h. 51m. Springs rise, $5\frac{1}{2}$ feet.

NEW DUNGENESS BAY.—The shore from Port Angeles gradually curves N.E., and about 8 or 9 miles from Ediz hook, another long low narrow sand spit covered with grass extends from the bluff shore in a general N.N.E. direction for $3\frac{1}{2}$ miles, forming the north-western side of New Dungeness bay.*

Dungeness shoal of 2 fathoms extends half a mile N.N.E. from the end of the spit, and a heavy tide rip runs over it at the change of the stream. A red buoy is moored at the extreme of this shoal.

On the inside, one mile from the eastern extremity, another narrow sand spit extends $1\frac{1}{2}$ miles southward towards the main shore, forming a large inner shoal bay with a narrow opening, through which the water passes as over a rapid; at low tide abreast this point is a small

* *See* Admiralty chart:—Admiralty inlet and Puget sound, No. 1,947; scale, $m = 0.52$ of an inch.

stream, on the western side of which is a bluff 60 feet high, and upon it is a large village of the Clallam Indians. Fresh water may be obtained in abundance at the above stream; but boats must obtain their supply at low tide, and come out when the tide has sufficiently risen.

The shore eastward of the stream is low, swampy, and covered with trees and brush, and off it are extensive mud flats, which uncover at low water for over half a mile, and extend to Washington or Budds harbour; shoal water exists for some distance outside these flats.

LIGHT.—**New Dungeness.**—From a conical lighthouse, the upper half black, the lower half white, surmounted by a red lantern, situated at about 2 cables from the extremity of the spit, is exhibited, at 100 feet above the sea, a *fixed white* light, visible in clear weather 16 miles.

Fog signal.—During thick or foggy weather, a whistle is sounded from a position 150 yards north-eastward from the lighthouse, in the following manner:—A blast of *six seconds* duration, succeeded by an interval of *twelve seconds*, then a blast lasting *three seconds* followed by an interval of *thirty-nine seconds*.

Telegraph cable.—A submarine cable extends from New Dungeness to Clover point (Vancouver island); there is a small house on the spit, one mile S.W. of the lighthouse, with the words, "cable crossing," on it.

Anchorage.—The usual and best anchorage in New Dungeness bay is to bring the lighthouse to bear N. $\frac{1}{2}$ W. half a mile distant, in 8 fathoms, sandy bottom. With the lighthouse bearing N.W. by N. three-quarters of a mile distant, the same depth and bottom are found; from this position a vessel can readily get under weigh and clear the point. A south-east wind drawing out of the strait blows directly into this bay, but the bottom will hold any vessel with good ground tackle; the only difficulty will be to get the anchors out of the mud after riding a couple of days to a gale.

Tides.—It is high water, full and change, at New Dungeness at 3h. 3m.; springs rise 5 feet.

WASHINGTON HARBOUR.—The coast from New Dungeness trends E.S.E. for nearly 7 miles to Washington harbour.

The entrance is almost closed by a long sand spit extending from the eastern side, leaving a narrow channel with only 2 fathoms, which deepens within to 13 fathoms; therefore, as a harbour, it is of little importance when there are so many good ones in the neighbourhood.

PORT DISCOVERY, where Vancouver anchored and refitted his ships, and from whence he commenced his exploration of these regions in May 1792, is an extensive inlet trending in a south-easterly direction for 6 miles, with an average breadth of $1\frac{1}{2}$ miles; the general depth of water is from 20 to 30 fathoms, but an anchorage may be had on the west side $1\frac{1}{2}$ miles within the entrance in 15 fathoms, close to the shore, also near the head of the port.

A spit extends a short distance off Clallam point, the western point of entrance; and when working up, the prominent points should not be closely approached, as the soil breaking away from the neighbouring cliffs has formed a bank off most of them.

Tides.—It is high water, full and change, in Port Discovery at 2h. 30m.; springs rise 7 feet.

Protection island lies immediately off the entrance of the Port Discovery, and shelters it from north-west winds. The highest part is near the western end and is 215 feet above the sea, but the fir trees by which it is covered make it look much higher. The coast is very steep, and the eastern part of the island is cultivated.

Dallas bank, on which vessels may anchor in from 4 to 10 fathoms, extends $2\frac{1}{2}$ miles N.N.W. from the island.

The north-west side of the island is shoal for $1\frac{1}{2}$ miles off, and there is a 3-fathoms patch, named Dallas shoal, $2\frac{1}{2}$ miles N.W. from the north point; reefs extend from the west, and south points about one mile, but there are clear deep channels between it and the main; that to the southward being one mile in breadth, and that to the eastward $1\frac{1}{2}$ miles.

A black buoy is moored on the reef, extending from the south-western end of the island.

Libby rock, with a depth of 11 feet, lies half a mile N.W. of Middle point; northward of the rock a red nun buoy, numbered 4, is moored in 8 fathoms.

ADMIRALTY INLET.—At 14 miles E.N.E. from New Dungeness light, is the entrance to Admiralty inlet, between Wilson

See chart, No. 1,947.

point on the south and Partridge point on the north, the latter a remarkable sloping cliff of a whitish colour; and here commences that extensive and singular series of inland navigation, which penetrates the continent in a general southerly direction for nearly 90 miles. These waters were first explored by Vancouver, and have since undergone a more detailed examination by the United States Government.*

General description.—Under special names the great body of water now known to the commercial world under the general designation of Puget sound may be described as a series of vast interior canals giving unsurpassed facilities for navigation in the very heart of a prosperous section of the country.

Puget sound, in the broad acceptation of the term, lies between latitudes $47^{\circ} 3' N.$ and $48^{\circ} 11' N.$; and between longitudes $122^{\circ} 10' W.$ and $123^{\circ} 10' W.$

Admiralty inlet extends in a general S.S.E. direction for about 60 miles, to the southern end of Vashon island; with an average width of $3\frac{1}{2}$ miles, and numerous branches from it on both sides form other straits, channels, bays, and harbours. At 16 miles within the entrance Hood canal opens out southward, and 9 miles further Possession sound opens northward and runs to the north-westward behind Whidbey island and leads into Rosario strait through Deception pass.

At the south end of Vashon island the Puget sound of Vancouver commences; the channels decrease in width to one or 2 miles, but they ramify by eight principal arms through an area of 22 miles square. The extreme north-western arm, named Case's inlet, reaches within 2 miles of the head of Hood canal, and between them lies comparatively low ground and a large lake.

The shores of these inlets are generally bluffs, ranging from 50 to 500 feet in height, and their tops are covered with trees and thick undergrowth to the very edges. It is difficult to recognise the different points from the sameness in the appearance in the shores.

The depth of water is everywhere great and anchorages are difficult to obtain near the shore.

The navigation of Puget sound should not be attempted without a pilot unless well acquainted with the various channels.

* See Admiralty chart:—Admiralty inlet and Puget sound, No. 1,947: scale, $m = 0.52$ inches.

Partridge bank, a ridge about one mile wide, extends $3\frac{1}{4}$ miles in a W.N.W. and E.S.E. direction, situated W.N.W. of Partridge point, its eastern end being $1\frac{1}{4}$ miles from the point. The shoalest part, a small patch of $2\frac{1}{4}$ fathoms, lies $3\frac{1}{2}$ miles W. by N. $\frac{1}{2}$ N. from Partridge point, and $3\frac{1}{2}$ miles S.S.E. $\frac{1}{2}$ E. from the lighthouse on Smith island. Depths of 4 and 5 fathoms extend one mile to the north-westward of the patch, and the water then deepens to 7 fathoms, this latter depth being found at a distance of $2\frac{1}{4}$ miles from Smith island; to the south-eastward of the patch the depths are 7 and 9 fathoms.

A black buoy is moored on the north-western edge of the patch of $2\frac{1}{4}$ fathoms.

WILSON POINT.—This point forms the western point of the entrance to Admiralty inlet. It is also the north-western point of the entrance of Port Townsend.

The high yellow clay cliffs surmounted by forest trend from Port Discovery to Port Townsend, and reach a height of 400 or 500 feet; they are very steep under a hill 250 feet high, about half a mile westward of Wilson point. This point stretches out towards Admiralty head and is formed of low sandy hillocks covered with coarse grass.

Between Middle point and Wilson point the 5-fathoms line is less than a quarter of a mile distant, except near Wilson point, where it extends half a mile over a very rough, rocky, and shingly bottom, with a field of kelp. The kelp field is well off the point on the north side of the bight just westward of the low extremity. During ebb tide a very strong eddy sets eastward along shore from Middle point, and even as far as Port Discovery.

Vessels working out from Port Townsend, with the strong summer winds, hold well under the south-east shore of Wilson point.

LIGHT.—Wilson point.—From the top of the light-keeper's dwelling (white) situated on Wilson point is exhibited, at an elevation of 53 feet above the sea, a *fixed white* light showing a *red flash* every *twenty* seconds, which should be seen in clear weather from a distance of 12 miles.

Fog signal.—A steam-whistle giving a blast of *eight* seconds duration each *minute* is sounded in thick or foggy weather from Wilson point.

Quimper peninsula.—Between Port Discovery and Port Townsend lies a peninsula averaging 3 miles in breadth and 10 miles long. It is undulating land and has many large farms.

Partridge point is the western point of Whidby island, and the eastern boundary of Juan de Fuca strait.

The seaward slope is very steep and shows large areas of sand and sandy soil. The coast line is level on the summit, which is covered with spruce, fir, and cedar. There are two noticeable cultivated farms on the shore about 3 miles to the northward of the point. The point is so rounding that it is not easily recognised on coming from the westward, but from the south and north it is well marked and prominent. Its face is composed of yellow sand, which, being blown up the hill by the strong west winds, has formed a very peculiar ridge on the outer face of the top. This is so narrow that it can hardly be travelled, and in many places it is 35 feet above the ground inside; yet being overgrown with bushes the ridge is now permanent. The highest part of the point is about 255 feet above high water.

Although the point is quite bold, yet drops suddenly, that, in foggy or smoky weather those running by the lead may be unexpectedly upon a boulder reef which extends half a mile from the point and is marked by kelp.

Off the end of the reef in 5 to 10 fathoms the tidal streams are very strong and there are overfalls at the changes.

A red bell buoy is placed in 15 fathoms about one mile from the point.

ADMIRALTY HEAD lies $5\frac{1}{2}$ miles E.S.E. from Partridge point, and directly opposite the entrance to Port Townsend. It is a nearly vertical, rocky cliff, 80 feet high, the summit is marked by the cluster of white lighthouse buildings; it falls away to the north to low marshy ground and a large lagoon.

Light.—From a light-keeper's dwelling (white) 41 feet high, situated on Admiralty head, N.E. by E. distant $3\frac{1}{4}$ miles from Wilson point, is exhibited, at an elevation of 108 feet above the sea, a *fixed white* light, which should be visible in clear weather from a distance of 16 miles.

Position.—Lat. $48^{\circ} 9' 15''$ N., long. $122^{\circ} 40' 35''$ W.

Admiralty bay is formed by a sweep of the shore line, forming a semicircle with a diameter of more than 3 miles. It is only used occasionally for anchorage just to the eastward of the lighthouse, where the bottom is hard and sandy in irregular ridges, and with depths of from 15 to 25 fathoms. It is an uncomfortable anchorage, for it is open to the full sweep of the south-easters, and at all times the current is running out. This current is so strong that even in the summer winds a vessel rides to it. With the wind from the southward a vessel would lie in the trough of the sea.

Sailing-vessels should not approach Admiralty head or bay, because in calm weather they encounter the strong and irregular currents near it, or they may be embayed under the eastern shore.

PORT TOWNSEND is just within the entrance of Admiralty inlet, now almost universally known as Puget sound, and is a port of entry for the Puget sound district. It is a safe harbour, but from its extent it is subject to a disagreeable sea in heavy winds, and with a strong south-easter, landing is oftentimes impracticable, and the sea dangerous for boats.*

The shores of the port are moderately high cliffs, with some valleys; the summits are covered with forest trees, except near the town.

Rock.—A vessel drawing 18 feet is reported to have struck on a rock from which the Custom-house bears N. 52° W. distant $3\frac{3}{4}$ cables.

Hudson point is a broad, low gravel spit, stretching out a quarter of a mile from the high cliffs of the town Port Townsend. Part of the town is built on this low point, and the custom-house is but a short distance from the wharves. A large sawmill is on the extremity of the point; extensive wharves project from the front of the town into deep water, and landing is readily and safely made. A quarter of a mile off these wharves there is a deep channel carrying 10 to 16 fathoms of water, through which the streams run with considerable velocity.

Within recent years a shoal has extended 250 to 300 yards northward of the point, marked on the outer edge by a spar buoy in 24 feet of water.

Kilisut or Long harbour penetrates Marrowstone island. At high water this harbour communicates by a crooked boat channel, 6 miles long, with Oak cove, at the southward.

* See Admiralty plan:—Port Townsend and Kilisut harbour, No. 1,792; scale, 1" = 3.0 inches.

LIGHT.—A *fixed red* light is exhibited from a white post on Hudson point, elevated 12 feet above the sea.

Kala point, on the western side of the bay, and within $1\frac{1}{4}$ miles of the head, is a low point. Half a mile southward of Kala point a small stream, named Chimikim creek, opens between two high, steep cliffs; the shoal water lies a quarter of a mile outside this mouth.

Walan point is a very low and marshy projection on the eastern side of the bay. Between it and Kala point the bay is one mile wide, and the depth 14 and 15 fathoms, over soft sticky bottom.

Directions.—Those bound into Port Townsend from Juan de Fuca strait must keep clear of the rocky shoal off the northern side of Wilson point, but as soon as Hudson point is opened by Wilson point the latter may be passed within 120 yards with a depth of 20 fathoms, hard bottom. When abreast of Wilson point a steamship should steer S.E. $\frac{1}{2}$ S. to clear the shoal ground north-west of Hudson point; but a sailing-vessel may keep a little inside this course until within half a mile of Hudson point, and then gradually keep away about a quarter of a mile from the shore in from 5 to 10 fathoms, over hard bottom, and as the point opens run quite close, with the summer wind directly offshore, to save making a tack. Keep along about half a mile to the S.W., parallel with the city front, and anchor anywhere off the wharves in from 10 to 12 fathoms, and a quarter of a mile distant. In winter anchor further out, to clear Hudson point in getting under way with a south-easter.

When sailing-vessels are coming down the sound bound into this port with the ebb stream, they should pass Marrowstone point nearly three-quarters of a mile before heading in for the town, and so avoid a very strong eddy which comes out of the bay along and under the high shore westward of this point. If the wind be light and the ebb strong, pass the point closely; run along the outside of the tide rip, and try to get upon the Mid-channel bank as soon as practicable, to avoid being set up the sound by the next flood stream.

In summer, sailing-vessels not employing tugs will frequently drift about the entrance for days without a breath of wind and with very strong streams. In winter, the south-east storms blow with great violence in this high latitude, and a vessel must move to an anchorage under the cliffs of the old military post to get a comfortable berth, in 10 fathoms, soft bottom.

Tides.—It is high water, full and change, approximately at 3h. 49m. ; springs rise $5\frac{1}{2}$ feet, neaps 5 feet ; they are, however, irregular.

Repairs.—Small repairs can be effected to machinery up to 700 I.H.P. ; four tons of metal can be run at one time ; cylinders of 50 inches and 12 feet long can be cast and bored ; boilers can be made ; shafting of 12 inches can be turned. Masts and boats can be built.

Weather signals are shown on the United States system, *see* page 15.

MARROWSTONE POINT is a low sandy point, extending 300 yards from the bluff, and forms an indentation on its southern face, where anchorage may be had in 12 fathoms, with an eddy invariably running northward.

LIGHT.—A *fixed red* light is shown from a white post and shed on Marrowstone point, elevated 15 feet above the sea.

Fog bell sounds a double blow *every fifteen seconds*.

Craven rock lies close to the shore, about $1\frac{1}{2}$ miles southward of Marrowstone point.

Bush point is on the eastern shore of Admiralty inlet ; it is low and projects half a mile from the general direction of the shore, and has one or two clumps of trees and bushes, with low ground behind and the ground rising therefrom and densely wooded. There is deep water close to the point, and anchorage may be had on the northern side in 15 fathoms, sandy bottom, but the streams are strong and irregular.*

LIGHT.—A *fixed white* light, elevated 25 feet above the sea, is exhibited on Bush point.

Nodule point, abreast Bush point, on the opposite shore, is a rounding bluff point, covered with trees, $1\frac{1}{2}$ miles North of the southern end of the island which forms the north-east shore of Oak bay. Directly off this point there is good anchorage in 12 to 15 fathoms.

**See* chart, No. 1,947.

Oak bay opens north-westward and extends nearly to Port Townsend. It has bluff shores nearly all around, the south-west face being limestone. When beating out of the inlet with a favourable stream do not work into the bay for the sake of a long tack.

Basalt point, the south entrance point of Oak bay, is a rounding jagged point, covered with trees to the shore line and rising to a moderate hillock covered with wood.

Klas rock lies a quarter of a mile N. by E. $\frac{1}{2}$ E. of Basalt point and the same distance offshore. It is a patch of rocks 175 yards in extent and marked with kelp. There is deep water around this danger and 16 fathoms between it and the shore.

MUTINY BAY, on the eastern side of Admiralty inlet, in the deep indentation between Bush point and Double bluff, has a narrow bank of 11 fathoms in its northern part, which affords good fishing.

Double bluff is a promontory one mile wide and $1\frac{1}{2}$ miles long, between Mutiny bay on the west and Useless bay on the east. The cliffs are 300 to 400 feet in height, and the greater part of the surface back from the face is covered with trees, but near the water it is destitute of trees, except one large clump, which marks it conspicuously in going up the sound.

Useless bay.—On the eastern side of Double bluff is nearly 5 miles broad at the mouth and $2\frac{1}{2}$ miles deep to the north-eastward. It lies broad open S.W. The shores are in part bluff and in part low, with a fringe of marsh nearly around the whole bay. At the head of the bay there are two long narrow sand spits, behind which lies Deer lagoon, a large shallow sheet of water, full of marsh isles and having a shoal outlet between the sand spits. At the eastern part of this lagoon is the settlement of Useless.

Scatchet head, the south-western point of Whidbey island, is visible for 25 miles from the southward. It is a double-headed promontory with a length of 6 miles and an extreme breadth of $2\frac{1}{2}$ miles between Useless bay and Possession sound.

The two heads are bold yellow clay cliffs; the eastern rises about 300 feet above the water, and is covered with wood, and the western one rises 140 feet or more. The western head has become locally known as the False Scatchet. Off the base of the cliffs there are seen great erratic granite boulders.

Possession point.—The lower part is a nearly vertical white clay cliff; the bank slopes at an angle of 45° , with a partially broken whitish front, until it reaches 140 feet elevation. There are a few scattered trees on the lower part of the slope, and the summit level is covered with them.

The shore under the eastern side of the head is bordered by a low narrow beach.

The eastern shore of the entrance to Possession sound abreast this head rises from a low narrow beach with deciduous trees on the lower slope and Oregon pine on the summit. Yellow bluffs show in patches through the trees.

Between the two heads there is a shallow bight running back $1\frac{1}{2}$ miles, named Cultus bay. It is in part overflowed at high tide, and then presents the appearance of a bay. A sand bank and shoal extends nearly 3 miles to the southward, with the breadth of the heads as a base. Off the eastern head a strong under-current runs into Possession sound, and a current setting to the westward at all times of tide.

Off the south side of Possession point, on the line of 3 fathoms, is a rock awash at the lowest tides. It is about 250 yards off the front of the cliffs.

PORT LUDLOW.—Southward of Basalt point and 2 miles W.S.W. of Foulweather bluff is the opening to Port Ludlow on the western side of the entrance to Hood canal. This bay has a broad entrance open towards the N.N.E.

The coast is in part low, broken bluff, with a gently rising country behind, covered with Oregon pine. Inside Sawmill point the bay affords good anchorage in 6 to 8 fathoms, over soft mud, for half a mile to the southward and westward. This small basin is completely landlocked, and is protected from gales from every quarter by the high land and high trees about it.

Tala point is a bluff head, covered on top with Oregon pine. From this point there is a bar of hard sand nearly a quarter of a mile wide within the 5-fathoms line, stretching in an outward curve to Colvos rocks, which lie one-third the distance from Basalt point to Tala point.

The 3-fathoms curve stretches nearly half a mile, with a width of a quarter of a mile, from Tala point to the northward, reaching to the black buoy; the bottom is hard sand.

Colvos rocks are a cluster of three rocks; the nearest one to the shore lies nearly half a mile S.E. of Basalt point. It is 25 feet high and of small extent. There is deep water around the north-west rock, but a long shoal stretches south-east from the largest. The bottom around is rock and hard sand. From these rocks there is a bar of less than 5 fathoms reaching in an outward curve towards Tala point.

There is very shoal ground for 250 yards southward from the south-east Colvos rock, and from this there is a long tail of hard sandy bottom stretching half a mile towards the red buoy.

Abreast the Colvos rocks, and nearly a quarter of a mile from the shore, there is a large rock, named Snake rock, 150 yards in extent and just awash at high tide. There is a narrow lane of 3 fathoms water just inside of it.

Directions.—The deepest channel into Port Ludlow lies outside Klas rock, and between the inner Colvos rock and Snake rock, where the channel is 600 yards wide between the 5-fathoms lines, and has 16 fathoms, over sticky bottom. Thence everything is clear to the head of the bay, gradually reducing the depth to 8 and 7 fathoms inside Saw Mill spit, and having good water under each shore, but the better water is under the western shore. There is a broad fore-shore, or low water beach, under the eastern shore.

The usual channel is between the Colvos rocks and Tala point, crossing the bar in $4\frac{1}{2}$ fathoms, over hard sandy bottom, between the red and black buoys.

FOULWEATHER BLUFF.—This is one of the most noticeable of the many cliffs in Puget sound. It is the northern extremity of a peninsula which separates Admiralty inlet from the entrance to Hood canal. The northern face is nearly vertical sandy clay cliffs about 225 feet high, and covered on the summit with firs and a very dense undergrowth. It slopes toward the east to a bluff 40 feet high, but on the side next to Hood canal the cliff is steep.

A rock awash at the lowest tides lies off the bluff, a little eastward of the middle of the face, and 3 fathoms is found outside this danger. It is intended to place a buoy outside of the rock in 5 fathoms.

Point No Point is low and just above high water, with a gully and small stream open just at the western part. To the southward

the shore is nearly straight for 10 miles, with increasing height to the cliffs, and a low narrow marshy line under them to Pilot point, $2\frac{1}{2}$ miles distant. The land behind it is 200 or 300 feet high and moderately wooded. Under the south side of the point there is good anchorage in 10 fathoms.

LIGHT.—On Point No Point, a *fixed white* light is exhibited at an elevation of 27 feet above the sea, and visible in clear weather from a distance of 10 miles.

The lighthouse is a square white tower with a black lantern.

Fog signal.—A bell is struck every *ten seconds*.

Apple Tree cove lies 6 miles S.E. by S. of Point No Point. From 5 to 12 fathoms, over sticky mud bottom, are found fully half a mile from the shore, and a depth of 6 fathoms is carried well into the cove. The head of the cove is $1\frac{1}{2}$ miles from the point, and vessels may avoid adverse currents by anchoring on the muddy bank. The head of the bay is marshy; no fresh water is obtainable here.

Edmund point.—Directly abreast of Apple Tree cove, on the east side of the inlet or sound, is Edmund point. It is a low, rounding point with a lagoon inside it. There is a bluff to the southward.

Wells point, south of Edmund point, is low and extends from the high bluff behind it.

President point and Jefferson point.—On the western side of the sound, and on the northern side of the entrance to Port Madison, there is moderately high, bluff shore, the land rising behind it and covered with trees. This southern face of Jefferson point is a low cliff in places. Stretching off the shore between President point and Jefferson point for more than half a mile there is a 9-fathoms bank which affords excellent anchorage when drifting with light airs and having adverse streams. Close under the south side and extending into 5 fathoms there is a compact mass of kelp.

PORT MADISON is broad and deep, ranging from 80 fathoms at the south-east part to 20 fathoms at the north-west part.

The northern shores of the bay are broken white cliffs and intervening low beaches. The western shore is moderately low cliffs, with the white buildings of the Indian reservation at the

entrance to Agate passage. The south shores are broken cliffs, except at the entrance to Port Madison dock.

The mills are half a mile inside the north-east point of the entrance, with ample wharf facilities and mooring dolphins.

Navigable depths.—The channel is narrow, and has a depth of 13 feet. Outside the entrance to this Inner port the water deepens to 15 fathoms in less than half a mile, except to the westward, where there is a long spit with only 13 to 18 feet upon it for nearly half a mile from the shore.

Monroe point.—The south-east point is a low, narrow sand spit, curving inward from the outer shore to the westward and merely outlying the cliffs 2 cables.

Very shoal water extends nearly to the 3-fathoms line, and then the depth increases to 10 fathoms in 50 yards and to 20 fathoms in 200 yards.

LIGHT.—A *fixed red* light is shown from a white stake on Monroe spit, 150 yards from the end of the spit, at an elevation of 25 feet above the sea.

BAINBRIDGE ISLAND lies in a deep bight of Great Peninsula, and its eastern coast forms the western shore of Admiralty inlet abreast West point and Duwamish bay. It is moderately high, has some high bluffs along the eastern shore, but this is broken by several indentations, forming anchorages and harbours.

PORT ORCHARD has its entrance in the south-western part of Port Madison. This entrance is very narrow and somewhat crooked, but has from 3 to 4 fathoms in it. Vessels must enter under easy sail and keep the lead going on each side to find the deepest water. When through give Bolin point a berth of nearly half a mile, to avoid the shoal extending eastward from it. Around Bolin point, Dogfish bay opens north-west, and near the head of the port, Dye inlet trends northward and westward.

Rich passage, the southern entrance to Port Orchard, is obstructed by rocks and is difficult of navigation. The winds are light and variable, and at its narrowest part, where it makes a sharp turn, the streams are strong.

An iron beacon 18 feet high, surmounted by a barrel painted black and white in horizontal stripes, stands on Orchard rocks. A red conical buoy is placed in 36 feet, 400 yards southward of Orchard rocks, with Orchard point S.S.E. $\frac{1}{2}$ E. about 5 cables. The rocks are covered at high water.

Dock.—The United States Government dry dock at Port Orchard is 640 feet long over all, 573 $\frac{1}{2}$ on the blocks, 93 $\frac{3}{4}$ feet wide at the entrance; has 30 feet over the sill, and 28 $\frac{1}{2}$ feet on the blocks.

Skiff point, at 3 miles S.S.E. of Munroe point on the west side of the inlet, projects fully half a mile into the channel. It is low, and rises regularly to a ridge to the westward; the bluff to the northward is moderately high.

Murden cove is just under Skiff point. The north-western shore is low; the southern shore has steep clay cliffs. The inner part of the cove has shoal water, but inside of the line of the two points there is anchorage in 10 to 15 fathoms.

Yemoalt point is the southern point of Murden cove. It is a low point, with gently rising land behind it. The cliffs to the northward and southward are moderately high and broken. There is deep water off the point.

EAGLE HARBOUR is a narrow indentation in the eastern shore of Bainbridge island. At the mouth the entrance is barely half a mile wide. The north side of the entrance is Wing point, very narrow and low.

A long, pebbly beach extends 300 or 400 yards S.E. from Wing point, and late surveys have developed a direct connection from this ledge to Blakely rock, running parallel with the shore. For three-quarters of a mile from the point on a line to Blakely rock there is found as little as 2 $\frac{1}{2}$ fathoms. Outside of this ledge the bottom drops very suddenly to 50 fathoms.

When bound into Port Blakely do not haul too close to the shore until within half a mile of Blakely rock.

If large vessels are bound into Eagle harbour, they would have to enter from the southward, close under the shore, and pass through the narrow but deep channel between the ledge and the shore.

Buoys.—A red nun buoy is moored near the south-east extremity of Wing point reef, half a mile from the point, and should not be

approached within 200 yards. A black can buoy marks the edge of the abrupt sand spit at south side of harbour entrance.

PORT BLAKELY is a moderately deep indentation on the north side of Restoration point, trending westward nearly one mile.

The usual outer anchorage of Port Blakely is S.E. by S. of the north point of the entrance, a little nearer the southern shore, in 13 fathoms, over sticky bottom. The deepest water in the entrance is 18 fathoms. The inner anchorage is about 3 cables inside the north point and rather nearer the southern shore than the northern, in $9\frac{1}{2}$ fathoms, over hard bottom. Here the width, under the northern and southern shores, is only 300 yards, and that width decreases further in.

Blakely rock.—In the outer road there is a ledge of rock nearly 2 cables in extent, and a large part of it is above water. The middle and highest part is 15 feet above water. There is shoal water and foul ground for 260 yards to the northward of the rock, with a bank of kelp extending into 7 fathoms water around it.

Directions.—On the south side of Blakely rock, there is deep water close to, with a passage between it and the northern part of Restoration point, nearly half a mile wide; this passage has 25 fathoms, with sticky bottom. The passage between the north entrance point and Blakely rock is half a mile wide between the 10-fathoms lines, and has 26 fathoms, over sticky bottom, so that vessels from the northward always pass between the rock and the north entrance point.

The approach from the northward is over the ledge joining Wing point with Blakely rock. A little less than half a mile north of Blakely rock, this ledge can be crossed in 9 fathoms, sandy bottom; but thence to Wing point the depth on the ledge decreases, and as little as $2\frac{1}{2}$ fathoms is found, with deep water inside. Outside the ledge the depth rapidly increases to 50 fathoms.

Restoration point is in some respects very peculiar; no other point in these waters, except Battery point, presents the same formation. For 300 yards it is flat, about 10 feet above high water, and has one foot depth of soil, covered with grass, over a limestone rock upheaved nearly on edge, the direction of the strata pointing toward Battery point, or a little south-eastward of it. Inshore the

land rises steeply about 100 feet, the sides covered with grass and its summit with fir trees. Around the whole south-eastern face of the point these peculiarities exist. On the upper levels of the high land adjacent are small lakes.

From the extremity of the point a ledge, dry at low water, and named Decatur reef, extends into the inlet 300 yards, the depth is 6 fathoms at 100 yards off its extremity, and 16 fathoms at a quarter of a mile. Southward of the point, anchorage may be had in 15 fathoms, over sticky bottom, a quarter of a mile from shore, or, as a rule for finding anchorage, bring Blakely rock north of the point, in line just over and inside of it. Kelp exists along the southern face.

Decatur reef is marked by a red ice-buoy in 8 fathoms, with Restoration point W. by N. $\frac{1}{2}$ N., distant 400 yards.

Orchard point is the low rocky point at the south side of the entrance to Rich passage into Port Orchard. Behind it the land rises into a moderate hillock with a low neck to the southward, and a cove inside the passage to the westward. Off this point the water is deep.

LIGHT.—A *fixed white* light is exhibited on Orchard point, elevated 25 feet above the sea.

Meadow point, nearly opposite Monroe point on the western shore of the sound, is a small low grassy point, with a marshy lagoon inside and higher ground rising behind.

WEST POINT is a sharp low grassy point projecting nearly one mile into the channel.

LIGHT.—On West point a *flashing* light exhibits *red* and *white* flashes alternately, at intervals of *ten seconds*. It is elevated 27 feet above high water, and visible 10 miles in clear weather.

Fog signal.—A steam trumpet gives a blast of *five seconds* duration at intervals of *twenty-five seconds*.

Shilshole bay and creek.—Between the two latter points is Shilshole bay, and at the bottom of the bay Shilshole creek empties, draining Union lake 3 miles to the eastward. Locally, this bay is known as Salmon bay. The shoal water extends furthest at the

mouth of the creek ; two feet can be carried into the mouth of this small stream at low water.

Anchorage may be had in Shilshole bay in 15 fathoms, over sandy bottom, with West point lighthouse bearing South, distant three-quarters of a mile.

There is a good anchorage in 7 to 10 fathoms about 250 yards from the shore between West point and Shilshole creek, and good protection from south-easters.

It has been proposed to excavate a channel from the sound to Union lake, and thus have a safe port in fresh water.

DUWAMISH BAY.—On the southern side of West point, Duwamish bay opens with a width of $5\frac{1}{4}$ miles, contracts rapidly to $2\frac{1}{4}$ miles, and continues with that width for 2 miles to the edge of the extensive flats at the mouth of the Duwamish river.*

On the southern side of the high wooded bluff commencing just eastward of West point there is a long horizontal cut, which is halfway between the water and the top ; it is a good landmark. This bluff is named Magnolia bluff ; it reaches nearly 400 feet elevation and continues with decreasing height for $1\frac{1}{2}$ miles East to a moderately wide cove, dry at low water, named Smith cove.

Under the foot of Magnolia bluff and nearly half a mile S.E. of its highest break, there is a large granite erratic boulder inside the low water line, and locally known as Four Mile rock. The broken bluff abreast this rock is 220 feet high, and the land behind it rises to nearly 400 feet.

From the eastern side of Smith cove the shore for 3 miles to Seattle is nearly straight and trends E.S.E. It is comparatively low, but the land behind rises rapidly to the top of the ridge between this bay and Union lake, the extreme height being 440 feet.

Duwamish river is a moderately large stream in the Cascade range of mountains, and running a general course to the north-west to Duwamish bay. A tributary from the north drains the extensive lakes, Washington and Sammamish ; and in its valleys and at the lakes there have been developed extensive deposits of coal and iron. The whole country is well wooded. The great mud flats at the head of Duwamish bay are formed from the sediments brought down by this river.

* See Admiralty plan :—Seattle harbour, No. 1,427 : scale, $m = 3\cdot0$ inches.

SEATTLE, in the north-eastern part of Duwamish bay, is an extensive town. Vessels can obtain all kinds of supplies. It is the shipping port for the coal mines in the vicinity, and large quantities are exported. Wheat is largely exported and the lumber business is extensive.

There is an extensive system of wharves in the extended frontage of Seattle, and steamboats and vessels go directly there to discharge and load. These wharves extend into to 3 and 4 fathoms. Vessels anchoring off the town find the best ground near the southern part of the town, where a depth of 15 to 20 fathoms over muddy bottom is found, 100 yards outside the wharves. It drops off suddenly from 15 fathoms.

Coal.—Vessels are rapidly loaded at the wharves by chutes, alongside which there are depths from 18 to 24 feet.

Directions.—When a sailing-vessel is getting under way from the anchorage off Seattle, the usual summer winds compel the first tack to be to the southward towards the edge of the great mud flat. If it be high water this flat cannot be distinguished, and the lead must be kept going. When a depth of 15 fathoms is struck, go about, for the water shoals to 3 fathoms very suddenly.

If the stream be ebb, those bound out of the sound should stand well into the inlet; and if bound up the sound should work close under and around Duwamish head to Battery point. If the stream be flood, those bound out of the inlet should work under the north shore and close to West point; if bound up the sound, they should work under the north shore about $3\frac{1}{2}$ miles to Magnolia point, or to the Four Mile rock, or until they can fetch well clear of Battery point. If calms prevail, the tug is employed to tow vessels in or out.

Steam tugs.—The tug service throughout the sound is good.

Repairs can be effected to large machinery. Cylinders of 110 inches can be cast and bored; 40 tons of metal can be run at one time; shafting 12 inches diameter at 20 feet long can be turned. Masts and boats can be built.

Tides.—It is high water, full and change, at Seattle at 4h. 44m.; springs rise 10 feet, neaps $8\frac{1}{2}$ feet.

Duwamish head is steep, about 320 feet high, and the summit is sparsely covered with the Oregon pine. The beach at low water extends $1\frac{1}{2}$ cables northward, when the shoal water is continued to the 3-fathoms line, which is 3 cables from the bluff, the drop to 20 fathoms is within 250 yards. Along the east side of the bluff the water is deep close inshore. Under the eastern side of the head is the town West Seattle, with an extensive sawmill and wharfage facilities. Nearly one mile inside the head is a small settlement named O'Connor, within the outer edge of the great flats.

A red bell-buoy is moored in 36 feet, with Duwamish head S.S.E. $\frac{1}{4}$ E. about 3 cables.

Battery point.—The south point of the entrance to Duwamish bay is Battery point. From the north-westward, just before reaching West point, Battery point is seen as a moderately low, bare, nearly flat-topped mound, with a steep cliff nearly 60 feet high towards the water, and a short, low point outside of it, which is the real point. Inside of the curiously shaped mound there is a low neck with large straggling pine trees, and behind this the land again rises.

From the south-eastward, beyond Brace point, the same characteristics are seen, with one lone pine trunk standing in the middle of the gently sloping surface of the mound. This tree shows now only the bare trunk; formerly it was a good mark.

On the north side of Battery point a vessel anchoring in 20 fathoms over sandy bottom cannot have a greater scope of chain than 35 fathoms, without being too close to the shore. The beach is smooth and very regular, being composed of sand and gravel.

LIGHT.—A *fixed white* light, elevated 12 feet above high water, on a white stake, is exhibited on Battery point.

Williams point is the first small, low, sandy and gravel point, 3 miles from Battery point. The land rises rapidly behind it and it is pine covered. It is the north point of Fauntleroy cove.

Brace point forms the south side of Fauntleroy cove. It is a small, low, sandy, gravelly point, backed by rapidly rising ground, covered with Oregon pine. When running north, before a vessel reaches Pully point, Brace point is seen as a moderately high wooded point just eastward of Battery point; the land behind the first rise falling a little and then rising to the eastward.

Fauntleroy cove.—This slight indentation is between Williams point and Brace point; the distance apart of these points is a little over three-quarters of a mile. Good anchorage may be had here in 10 and 12 fathoms. Fresh water is easily obtained in the vicinity.

Pully point is $4\frac{1}{2}$ miles from Brace point. It is a low point with a flat rounding hillock behind it, and upon which stands one large high tree in the middle and two or three smaller ones straggling on each side. The extremity of the point is sand and gravel and it pitches sharply off into very deep water, the 50-fathoms line lying but a short distance outside, with 120 fathoms in mid-channel. There is deep water on the north and south sides; strong streams sweep by it.

Blake island, at the northern entrance to Colvos passage, is about one mile in extent, not high, but covered with wood, except at the eastern point, which is low and pebbly. The eastern side of the island is low, with straggling trees, and the land rises to near the western side. There is anchorage in 17 to 18 fathoms close under the east point, with bottom of soft mud.

Allen bank extends from Blake island, with less than 20 fathoms across to Vashon point at the entrance to Colvos passage. The bottom is variable; in some places mud and in others hard sand. The depth is greater near the island and decreases to as little as $8\frac{1}{2}$ fathoms one mile N. $\frac{1}{2}$ W. of Vashon point. This bank has proved of great service to vessels losing the wind and having adverse streams; the more especially when the Colvos passage was the channel used by all vessels.

Vashon island is the largest in Admiralty inlet and Puget sound. It is high, with steep coast, covered with wood and undergrowth. Its surface is marshy, in many parts quite elevated. The coast line of the island is 47 miles, and around there is a belt of kelp in the latter part of the summer and autumn, but it is torn away by the storms of the winter and spring.

The easternmost projection of the coast of Vashon island is a curiously shaped peninsula, named Maury island, $4\frac{1}{2}$ miles long and $1\frac{1}{2}$ miles wide, lying at the south-east part of Vashon island. This peninsula is high and wooded.

The north-west part is connected with Vashon island by a low sandy neck of land 100 yards wide. The bight at the north end of this neck is Tramp harbour.

In the earlier years of the navigation of these waters by large sailing-vessels, Colvos passage was universally used, but in recent years the development of Tacoma and the use of tugs have changed the whole traffic to the main channel between Vashon island and the main shore to the eastward. In this channel the streams are not strong, the chances for anchoring are few, and it is sometimes calm while there is a fine breeze blowing through Colvos passage.

The main channel on the east side of Vashon island is the best to work in with a head wind.

Quartermaster harbour, the deep bay on the south side of the neck and between Vashon island and Maury island, is $3\frac{1}{2}$ miles long and over half a mile wide, with 5 to 10 fathoms, over gray sand and mud at the north extremity. This bay is an excellent shelter at 2 miles inside the entrance, with good water and good holding ground. There is a dock here, *see* page 56.

Vashon point, the northern point of the island, is a high rounding bluff, covered with Oregon pine. Off the north of Vashon island there is good anchorage from about one-third of a mile off-shore, with protection from south-easters.

Dolphin point is a high bluff, covered with Oregon pine to the base. Good anchorage is reported in from 7 to 14 fathoms.

In the bight between this point and Beals point there are three rocks above water close under the shore. The southernmost is on the north-west side of Beals point, and is 14 feet above water; the other two are respectively 7 and 6 feet high.

Beals point, at $2\frac{1}{2}$ miles from Dolphin point, is a wooded point, rising gradually to several hundred feet, but it does not project far into the channel; there is deep water close off it.

Robinson point is the easternmost projection of Maury island; it stretches well over toward the eastern shore of the channel, which it reduces in width to 2 miles. The extremity of the spit is 150 yards outside the trees, with intervening marshy ground, and then a bluff, which is about 30 feet high, covered on the top with trees. The bluff rises to about 70 feet.

South of Heyer point is a broad open bight named Tramp harbour, with a very low shore on the southern part and nearly connected with the head of Quartermaster harbour. In this bight there is anchorage in 15 to 18 fathoms, over fine gray sand; this is a good anchorage, and there is fresh water.

LIGHT.—A *fixed red* light, elevated 40 feet above the sea, is exhibited from a white post on Robinson point.

Fog signal.—A steam whistle is sounded *six seconds* at interval of *fifty-four seconds*.

Brown point is the north point of the entrance to Commencement bay. On the outer point to the north it is low and gravelly with gently rising wooded ground behind a marshy spot inside the low point. On the south face of the point the shore rises gradually and irregularly in white clay cliffs from 25 to 200 feet high within half a mile from the point.

Dash point is the low point $1\frac{1}{10}$ miles N. by E. of Brown point.

LIGHT.—A *fixed white* light is exhibited from a white stake on Brown point.

COMMENCEMENT BAY.—South of Robinson point the width of the inlet is $3\frac{1}{2}$ miles, with high bluff, wooded shores on both sides: on the north-western shore the bluffs are unbroken; on the south-east they are broken by small streams. At the head of the bay there is an extensive mud flat, and low marsh land formed by the deposits brought down by the Puyallup river. This is a large stream flowing from the Cascade range and nearly parallel with the Duwamish or White river.*

Throughout the bay the depth is great, ranging from 88 fathoms in the middle of the entrance to 30 fathoms close under either shore, and 20 fathoms close to the edge of the mud flats, which are dry at low water. No special directions are needed to enter or leave this bay.

The anchorage off Tacoma is not good, because the depth is too great and increases very rapidly offshore. There is good anchorage under the north shore beginning three-quarters of a mile eastward of Brown point: this anchorage is well sheltered from all but the south-easters of winter.

* See Admiralty plan:—Tacoma harbour. No. 1,127: scale, $m = 3\cdot0$ inches.

There is anchorage off the wharf at Old Tacoma in 15 fathoms, coarse mud and stones, with Brown point N. 5° E., and Daleo point N. 57° W.*

Tides.—The eddies are so very irregular in Commencement bay that to steer by courses in thick weather are almost useless. There is a peculiar film of whitish water on the surface of the bay during ebb tide, and first quarter of the flood; this rarely leaves the bay and is said to come from the glacial waters brought down by the Puyallup river. When in or off the entrance to this bay the snow-covered summit of mount Rainier shows distinctly over the low ground at the head of the bay.

Tacoma, on the south-western side of the bay, is the terminus of the Northern Pacific railroad. The principal trade is in wheat, coal, and lumber. Supplies of all kinds may be obtained.

Coal.—Vessels coal from alongside wharves, at which the depth is 23 to 33 feet at low water. Coal is loaded for shipment by staithees at the rate of from 100 to 150 tons per hour.

Dock.—In connection with the workshops which are at Tacoma, a floating dock is moored, in 8 fathoms, in Quartermaster harbour on the north side of the channel. The dock, capable of receiving vessels of large tonnage, is 325 feet long, 100 feet broad, and 80 feet between side walls, lifting power 8,000 tons.

Repairs can be effected to large machinery. About 7 tons of metal can be run at one time; cylinders of 96 inches can be cast; shafting of 15 inches diameter and 24 feet long can be turned; pipes of 8 inches diameter can be brazed; masts and boats can be built. Crane lifts 4 tons, depths alongside 8 feet, but at very high tide 12 feet.

Tides.—It is high water, full and change, at 4h. 45m.; springs rise 10½ feet, neaps 9 feet.

COLVOS PASSAGE.—Before the general use of steam-tugs on these waters, and before the development of Tacoma as the terminus of a trans-continental railroad, this passage was the almost invariably used ship channel to and from Puget sound. It is formed by the western coast of Vashon island and the eastern of the Great peninsula. The best anchorage is under the eastern shore, near the

north entrance, about $1\frac{1}{2}$ miles from Vashon point, in 5 to 10 fathoms. This anchorage is known as Fern cove, and the low point forming the southern shore is Peter point.

There is usually more wind in this passage than in the broad passage eastward of Vashon island, and much stronger streams. There are no known dangers in this passage.

Southworth point is low near the water, but rises to a high wooded bluff. It has deep water close under its south-east side, but anchorage may be had off the north side.

Dalco point is the south-western point of Vashon island, where Colvos passage opens to the southward. The southernmost point of the island is Neill point, which is nearly one mile eastward of Dalco point.

The passage between Neill point and Defiance point is known as Dalco passage.

The NARROWS.—There is a relatively narrow passage leading from the more expansive channels of Admiralty inlet proper to the narrower but greatly ramified inlets of Puget sound. Through it pass all the waters of Puget sound.

The average width of the Narrows is about three-quarters of a mile; the shores are high, bold, and in some places rocky; the summit of the cliffs are wooded. Midway through the Narrows the high long rounding point on the west side is Evans point, and close under it is a sunken rock with kelp around it and in other patches along the shore.

Evans rock lies about 130 yards off shore, has about $4\frac{1}{2}$ feet upon it at extreme low tides, and the pilots of the steamboats have special marks for passing close to it. It is locally known as the "Boulder." At the extreme low tides of the year, about June, this rock shows just above the water for a few minutes at the slack.

Tidal streams.—In mid-channel the regular flood and ebb stream are always found to run from a half to one hour after high and low water. There are generally considerable rips, especially at springs, with strong swirls, which make the water very rough and dangerous for small boats, more particularly when the winds are contrary to the streams.

On the east side of the Narrows and southward of Defiance point a strong eddy is found on the flood tide from about abreast of Evans

point to Defiance point. This eddy is much used by small steamers but great care must be exercised when close to Defiance point, if bound through Dalco passage to Tacoma, to haul out gradually to meet the strong flood at the point instead of running into it almost at right angles. The line between the flood and the eddy is well marked by the rip, and as both are strong care is demanded.

On the western side of the Narrows, between Evans point and Gig harbour, there is a strong eddy on the ebb tide. This eddy is always taken advantage of by steamboats and small craft, but the pilots of boats using this eddy must be careful to keep clear of the "Boulder," or Evans rock. Between Evans point and Fosdick point there is slack water very close under the shore during the flood, but only the smallest craft can take advantage of it.

Defiance point is the north-east point of the northern entrance to the Narrows. It rises by several steps. Between high and low water-mark there is a narrow ledge or shelf of rock bare at low water. The face of this rock is almost perpendicular, with 5 fathoms alongside, and at 70 yards off 10 fathoms over rocky bottom. Above this rocky ledge there is a rise of 40 feet, a slope reaching 50 feet higher, and a third rise of 100 feet, above which the head is densely wooded, and the ground rises gradually inland. The face of the cliff is too steep for trees, and is a bright yellow colour. On the east side strong eddies exist around the point on the flood.

Gig harbour. — On the western side of the Narrows, at the northern entrance, and directly opposite Defiance point, there is a small boat harbour, with a depth of 10 feet in the entrance and 5 fathoms inside. The entrance is very narrow.

Day island anchorage. — At the southern entrance to the Narrows, on the eastern side, there is a small narrow projecting point from the eastern shore, which forms a little cove on the north side. Anchorage may be had in 15 fathoms, but there are strong swirling streams which make it an uncomfortable berth. On the southern side of this little peninsula, and outside the kelp, anchorage may also be had, but the streams are strong. There is a small patch of kelp, with boulders, close off Day island.

PUGET SOUND. — This name is applied in its original meaning for the sake of sub-dividing these waters. Up to the Narrows the channel had been broad, open, and nearly straight; south of the

Narrows the shore line of the sound and of the islands in it amounts to 280 miles, with deep water along almost every mile. The main body of the sound lies to the southward and westward.

The navigation is very simple in good weather, but in thick and foggy weather it requires a full local knowledge of the streams and the peculiarities of the echoes from all points passed by the steam-boats. With a knowledge of the tides the captains and pilots run in foggy or thick smoky weather by courses and time-distances, and when approaching any point they ascertain its distance and bearing by the echo of their steam-whistle from the shores. No minute sailing directions could be drawn up to take the place of the local knowledge and experience of the pilots, and general directions are only suggestive in good weather, for the chart is the best guide.

Fox island is $4\frac{1}{2}$ miles long W.N.W. and E.S.E., with an average width of one mile. The passage between it and the mainland to the north is known as Hale passage. The north-easternmost part of the island is a bright yellow cliff, estimated to be 70 feet high, and covered with Oregon pine.

Whollochett bay.—This is a moderately wide bay, opening into the north side of Hale passage, opposite the middle of the north shore of Fox island, and one mile west of Fosdick point, at the southern entrance of the Narrows. The immediate shores of this bay are low, rising to wooded high land, and affords a good and sheltered anchorage.

Toliva shoal.—This danger, with 13 feet over it, lies directly in line of the southern entrance to the Narrows. It is one mile from Gibson point at the south-east part of Fox island, and one mile from the eastern main shore.

The bottom of the shoal and around it is foul and marked by a patch of kelp. The tide rip upon the shoal is very great, and with a little wind it raises a confused short swell sufficient to swamp a small boat.

Toliva shoal is marked on the northern side by a red and black nun buoy.

Steilacoom.—On the eastern shore, 9 miles southward from Defiance point, is the town Steilacoom, situated upon a bluff. There

is a wharf for the steamboat landing, and in approaching in thick weather the echo of the vessel's steam-whistle is very good.

When approaching from the northward keep along under the eastern shore to avoid Toliva shoal, and if bound for Steilacoom, anchor off the town in 15 fathoms, over hard bottom about 400 yards off shore. The tide rip in the channel abreast of the town is frequently sufficient, with a little wind, to swamp a small boat.

Steilacoom river is a small stream emptying into the sound one mile northward of the town, but is now locally known as Chambers creek.

Tides.—It is high water, full and change, Steilacoom, at 4h. 46m.; springs rise 11 feet, neaps $9\frac{1}{4}$ feet.

Ketron island is narrow, $1\frac{1}{2}$ miles long, lying parallel with the shore, one mile southward of Steilacoom, with a passage on the east side named Cormorant pass. The island is from 60 to 100 feet high, with steep sides, and is covered with tall Oregon pine.

McNeil island is about 3 miles long, east and west, and $2\frac{1}{2}$ miles wide. Between its north side and the south side of Fox island there is a channel $1\frac{1}{2}$ miles wide running for some miles into Carr inlet. Between the south side of the island and the north side of Anderson island there is a comparatively narrow channel, known as Balch passage. McNeil island is high and wooded.

LIGHT.—On the southern end of Eagle island, a *fixed white* light is exhibited from an elevation of 25 feet.

Anderson island is moderately high and wooded, with deep water around the coast and no known dangers. It is a little over 3 miles from Steilacoom and is 4 miles long, north and south, and about $2\frac{1}{2}$ miles broad. The southern end reaches well down into the southern part of the sound opposite the mouth of Nisqually river. There are good passages all around the island, with the broadest towards Nisqually, forming Nisqually reach.

Caution.—When rounding the south point of Anderson island, give it a good berth, as foul bottom exists there.

Nisqually reach is between the south end of Anderson island and Nisqually flats. The south end of Anderson island opposite the

bank is called Turku point, or Lyle point; a long, founding, moderately low point, with trees coming down to high-water mark; and under the west side there is a slight indentation named Thompson cove, with anchorage in 5 and 6 fathoms. Off Turku point there are strong tide rips on the flood.

Nisqually flats are $3\frac{1}{2}$ miles in extent, W. by S. and E. by N., and about three-quarters of a mile wide. They lie off the broad, low, marshy valley through which the Nisqually river and its ramifications reach the sound. There is deep water along the northern edge of the flats, but especially towards the eastern limit.

Nisqually is 5 miles South of Steilacoom, on the same side of the sound. It is at the mouth of a small stream and at the eastern edge of the extensive Inskip bank or Nisqually flats.

Nisqually landing is one mile North of the Nisqually river, where the Signalilchew creek empties. There is a sawmill on the creek. This creek is the natural outlet of the chain of lakes on the prairies; one of these lakes, American lake, is several miles long.

Tides.—It is high water, full and change, at Nisqually at 6h. 0m.; springs rise 18 feet, neaps 15.

Devil's head.—This is a bluff about 80 feet above the water, and covered with trees that reach a height of 100 feet. There are trees under the bluff down to the very narrow sand beach. It is the southern point of the unnamed peninsula between Carr inlet on the east, and Case inlet on the west.

Moody point is the extremity of the promontory between the broad waters towards Drayton passage and Nisqually reach, and the narrow arm of the sound on the west, named Henderson islet. It is a low, sandy point, with some unpainted shanties under the trees and bluff, which are inside and behind the low shore. Moody point is locally known as Johnson point.

LIGHT.—A *fixed white* light, elevated 25 feet above high water, is exhibited on Moody (Johnson) point.

Itsami shoal lies one mile from the northernmost extremity of Moody or Johnson point, and half a mile from the nearest shore of Hartstene island to the west. It is a rocky patch, having 9 feet on it, with kelp spreading out to a depth of $3\frac{1}{2}$ fathoms. There are

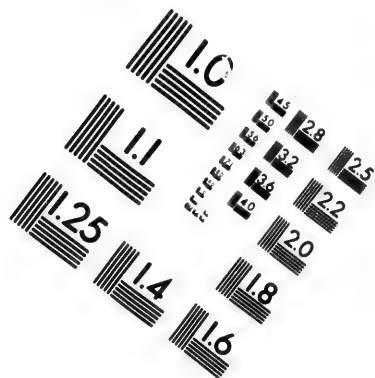
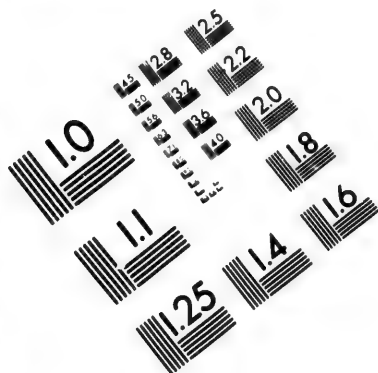
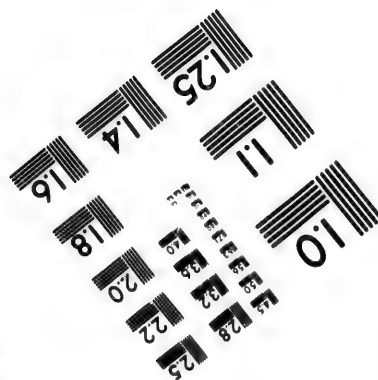
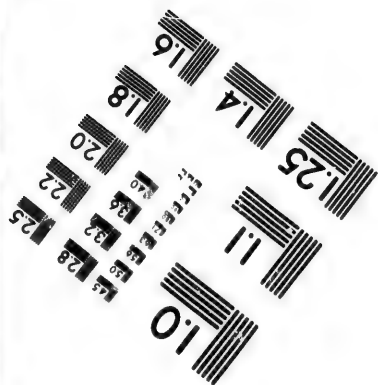
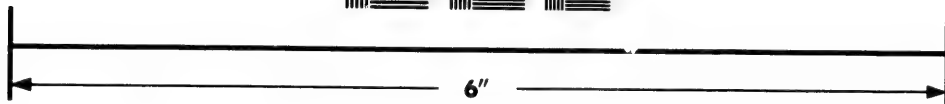
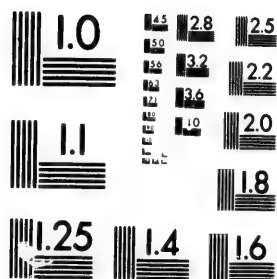


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10 fathoms between the shoal and the west shore of Moody point and 6 fathoms between it and Dickerson point. Itsami shoal is marked on the north side by a nun buoy coloured red and black in horizontal stripes, with Johnson point N.E. $\frac{3}{4}$ E., and Dickerson point S.S.W. Vessels bound to Olympia should leave it on the port hand.

Dana passage.—From Itsami shoal the passage is contracted to about half a mile wide with mid-channel depths of 20 to 15 fathoms over coarse gray sand, shells, and gravel, and good water close to the shores. The eastern shore is indented and moderately low, but covered with Oregon fir; the western shore is formed by the south side of Hartstene island and is higher than the eastern shore. There are very strong streams during spring tides in this passage. There is foul bottom close to Brisco point, and the edge of the channel is steep-to.

Brisco point is 60 feet high, wooded, and has good water close to it on the east side, but the 3-fathoms line extends 300 yards south from the point, with a fringe of kelp in 4 fathoms, and with a narrow, low neck on the north. The channel immediately on the west side of the point is Peale pass.

Dofflemyer point is low and cleared on the north, with cliffs 80 feet high to the southward.

LIGHT.—A *fixed white* light is exhibited on Dofflemyer point.

Cooper point, at the western side of the entrance to Budd inlet, projects to the northward; it is low and sharp and rises to 80 feet in half mile towards the south. It divides Budd inlet from Eld inlet, and the 3 fathoms line extends 300 yards from the point and narrows the entrance to Eld inlet.

BUDD INLET, at the head of Puget sound, is 6 miles long, in a general direction is S.S.E. At $1\frac{1}{2}$ miles northward of Olympia the inlet is occupied by a mud flat, of which one-fourth is bare at low water, and this shoal within the 3-fathoms line extends from the head of the bay under the east shore for 2 miles towards Wepusec inlet.

The average depth is 6 fathoms, over a bottom of mud. A stony patch, in part bare at low water, and surrounded by hard bottom in

one to 3 fathoms, lies a little abreast the bluff three-quarters of a mile north of Butler cove. This shoal is marked on its northern edge by a red buoy. Many vessels go to the wharf at Olympia at high water and lie there in the soft mud at low water. Steamboats run up to the wharves at high water, but if intending to move during the time of low water they must lie nearly one mile N.W., under the west shore, where there is a wharf, and whence there is a good road along the shore to Olympia.

Olympia is the capital of Washington. It has educational institutions, manufacturing establishments, sawmills, &c. The lumber output of the country is large, and extensive deposits of coal have been found.

A wharf projects northward from the town through the middle of the flats, about half a mile beyond the old wharf, into 6 feet water at the lowest tides. Dredging is in progress.

Tumwater is a village about one mile south of Olympia, on the De Chutes river, where the water-power of the falls is utilised by mills for various products of manufacture.

LIGHTS.—Two *fixed red* lights are shown at Olympia.

Tides.—It is high water, full and change, at Olympia, at 5h. 30m.; springs rise 14 feet.

Directions.—It would be useless to attempt to describe the route between Olympia and Steilacoom, because a pilot or a chart is absolutely necessary to make the passage. In foggy weather, or in the dense smoky weather of a dry summer, it is impossible to see a ship's length ahead, with irregular streams to add to the difficulty. The chart is then almost useless, and a thorough local knowledge of every mark on the beaches and of the peculiarities of the echo of the steam-whistle from every cliff and point are necessary.

HOOD CANAL.—This arm of Admiralty inlet opens 14 miles inside the entrance to the inlet off Wilson point, on the western side of the channel, between Foulweather bluff and Basalt point on the west.

The shores of the canal are bold, high, and wooded, rising to much greater heights than anywhere else on the inlet. This is particularly so on the western shore, where the west shore of the Dabop bay

attains an elevation of 2,600 feet in less than 2 miles from the water. These high flanking mountains of Olympus range are named Jupiter hills.

Hood's head is the island like mass on the western side of Hood canal, 3 miles inside Foulweather bluff. There is anchorage north-westward of the head in 15 fathoms, over muddy bottom, at one-third of a mile from the shore.

The north face of the head is a very steep bare cliff, and the south face is a rounding, high, bare cliff. All behind the cliffs is covered with pine. At the north-east point of the head, a low sandy point extends 300 yards and terminates in a point; towards the higher point the ground is marshy. This is Hannon point, and off it deep water is found with strong swirling tides.

PORT GAMBLE is a land-locked bay, $2\frac{1}{3}$ miles long north and south, with a nearly uniform width of half a mile. It narrows at the entrance between two low grassy sand spits only 300 yards apart, and with a channel of 120 yards wide between the 3-fathoms lines. The deepest water in the bay is 9 fathoms, and it may be said to have an uniform depth of 5 fathoms. On the western point of the entrance is a sawmill, and the buildings reach to the rise of the bluff to the westward. The wharves on the western point are built out so that vessels have deep water between them and East point.

A black can buoy marks the edge of the mud bank on the eastern side of the channel in 16 feet water.

Directions.—When entering under sail, drop in with the early flood. Loaded vessels are towed in and out by the tug; when without the tug they must warp out in summer with the last of the ebb or trust to a light southerly air in the morning, with an ebb stream. None but small, smartly working vessels can beat out, and very few of them have done so within channel limits. When in a small vessel beating out, go out on the ebb.

Inside the sawmill and Indian village point there is good water in mid-channel for anchorage. On the east side of the steamboat wharf there is a depth of 5 to 22 feet, the shoaler water being at the northern end. On the southern side of the wharf, where the lumber vessels lie to receive their cargoes, there is a depth of from 21 to 24 feet at 20 feet from the wharf. Inside the steamboat wharf,

with an opening to the northward, there is a "gridiron," upon which small vessels are taken for repair or examination. It has 12 feet water on it at high tide.

Squamish harbour.—At nearly one mile S.S.W. of Hood's head, is Termination point, with high wooded land behind it and a low narrow beach in front. Case sandbank, parallel with the west side, one mile long, and nearly half a mile wide, lies within one-third of a mile of the west shore. There is a 6-fathoms channel inside of this shoal and around the north end.

From Termination point the 10-fathoms line trends South, to the Sisters rocks covered at half tide. There is a depth of 7 fathoms between them, and good water all around. These rocks are also known as the Squamish rocks. The north shore of the harbour is called Yulkat bluff.

Seabeck bay.—Southward from Termination and Salisbury points the canal runs for 12 miles, S. by W., with a general width of $1\frac{1}{2}$ miles, gradually decreasing to the point of the Toandos peninsula.

The eastern point of Toandos peninsula is Hazel point, and under the eastern shore of this reach and directly abreast Oak head lies Seabeck bay, an indentation of one mile in a southerly direction. At its narrow head there is the mouth of a small stream. On the old charts the projection was called Seabeck point; on the recent ones it is named Misery point.

Oak head is the southernmost projection of Toandos peninsula. It is high and abrupt with deep water close under the shore. Fisherman's bay, just on the eastern side of Oak head, is a long narrow cove.

Dabop bay has very bold shores, deep water, and very high hills on the west side. The western arm at the north is named Quilcene bay, and is shallow and marshy at the head, where there is a small settlement named Quilcene on the left bank of Big river.

Dusewallips river.—Abreast of Oak head, on the western side of Dabop bay, the river empties and has formed a flat delta and a broad shoal in front. This shoal is 2 miles long and half a mile wide with deep water close up to it. Between this shoal and Tskutsko point, the nearest part of the Toandos peninsula, the width

See chart, No. 1347.

of the bay is nearly 2 miles and the depth of the water is 80 fathoms over muddy bottom.

Quatsap point, at 4 miles S.W. of Oak head, and on the west side of the canal is a moderately low head, under the south side of which is a broad open bay one mile wide with an extensive flat. This bay receives the Duckabus river, which brings down much detritus.

Hamahama river empties on the west side of the canal, 12 miles S.S.W. of Oak head. This river drains a large lake 4 or 5 miles behind the high mountains over the shore and into this lake a large stream comes from the Olympian range.

Annas bay is the southernmost part of Hood canal at the Great Bend, and it receives the water of Skokomish river, which has brought down so much sediment that a square mile of the bay is a great sand and mud flat with deep water around the outer edge to the west and north. There is deep water between the western edge of this bank and the western main shore one mile distant. On the point at the south side of the shore of the inlet and forming the east side of Annas bay is the village Union City, which has a road through to Oakland on Hammersley inlet.

The Skokomish is a large mountain stream coming around the south-east flank of the Olympian mountains. It drains a large lake named Cushman, high up the flanks of mount Ellinor.

Ayers point is the head which forms the furthest projection of the Great peninsula from the northward into the canal at Annas bay. It is a high rounding point and has deep water close under it.

Sisters point is a high rounding bluff on the north shore of the canal, 4 miles eastward of Ayers point. It projects from the northward, and nearly shuts the canal, leaving a channel only half a mile wide, with deep water over gravelly bottom.

Clifton village is at the extreme head of Hood canal, with a long sand and mud flat for $2\frac{1}{2}$ miles down the canal. There is a road thence to Oakland, another to Lightville, at the head of Case inlet, and a third to Seabeck harbour.

POSSESSION SOUND.—The southern entrance to this now important and extensive series of broad deep channels lies between Possession point, the southernmost point of Whidbey island, and

the main shore opposite, unmarked by any special projection or object. Scatchet head and Possession point have already been described on pages 42, 43.

The northern entrance to this sound is the intricate and narrow Deception pass. The sound receives several important watercourses, Snohomish river in the south-east, Stillaguamish river about the middle, with Skagit river in the north-east. It also connects at the north by the Swinomish slough with Padilla bay, and thence with Guemes channel and Bellingham bay.

The depth throughout the sound is great, except at the deltas of the rivers, which bring down an immense amount of alluvial material which forms mud flats. That from the Squonamish river has nearly filled in across the sound and reduced the channel to one-third of a mile wide with only 4 to 6 fathoms water. There are numerous villages and towns on the rivers and shores of the sound, and beside the traffic by sailing-vessels, regular communication is kept up by steamer from Seattle with all the towns and settlements.

The shores present the general features of Puget sound, but the channels are narrower. There are no known dangers in the channels. The shores of the deltas of the rivers are low and muddy, and behind them there is a dense forest and undergrowth.

Everett (Port Gardner).—The southern part of the sound runs north from Possession point for $3\frac{1}{2}$ miles to abreast Elliot point on the east, when it widens out into a nearly circular basin $5\frac{1}{2}$ miles in diameter, with Gedney island in the middle; this basin is locally known as Port Gardner, although the chart restricts that name to the south-east part. This port receives the Snohomish river in the north-east part, its lower course comes through a marshy valley 2 miles wide. Behind Elliot point is the town Muckilteo; and 4 miles further along the shore to the north-east is the town Everett.

Gedney island, lying in the middle of Port Gardner, is $1\frac{1}{2}$ miles long W.N.W. and E.S.E. When seen from Saratoga passage, it shows a moderately steep bluff to the west and a low slowly rising bluff to the east, both covered with Oregon pine.

Tulalip lies on the main shore nearly abreast of Allen point, at the entrance to Port Susan. The bay is protected by two points, and somewhat restricted by a shoal extending from the north-west point

to the middle of the opening. The entrance is open to the southwest, and the two points are about one-third of a mile apart.

Two buoys mark the entrance to this anchorage. One a black spar buoy, the other a red spar buoy.

Buoys.—Three all red spar buoys mark the channel over the flats from Utsalady, on the north side of Camano island, to Skagit river. These buoys are moored in depths of 12 to 16 feet at high water, and should be left to the southward.

Small red spar buoys mark the channel over the flats from Utsalady to Stanwood, Stillaguamish river. These buoys are moored in depths of 12 to 15 feet at high water, and should be left to the westward.

Six small red spar buoys mark the channel over the flats at the north end of Port Susan. These buoys are moored in depths of 9 to 10 feet at high water, and should be left to the eastward.

Six spar buoys mark the channel leading into Davis slough, one of the mouths of the Snohomish river.

The entrance to Skagit river is marked by buoys, as is also La Conner, at the south entrance of Swinomish slough.

SARATOGA PASSAGE is the broad, deep strait, leading from Port Gardner between Camano island on the east and Whidbey island on the west; from Camano head to the mills of Utsalady is 18 miles long. The strait averages 2 miles in width; the shores are bluffs covered with Oregon pine, but not so densely as before the sawmills depleted the forests.

Sandy point, on Whidbey island, is moderately long, low, and has no bushes. The bluff behind it rises by three steps, with straggling trees. There is a house at the inner or western end of the low beach of the point, with a cleared space on the sloping, rising ground, and a white house in the upper part of the clearing. It is locally known as Joe Brown's point.

LIGHT.—A *fixed white* light is exhibited from a stake on Sandy point.

East point, on the western side of Saratoga passage, 6 miles from Sandy point, is a low, grassy spit, backed by a high bluff well

wooded ; the tops of the trees are estimated to be 150 feet above the water.

Rocky point is low at the water's edge and rises gradually to 80 feet ; the trees have been cut away and scrub now covers it. About 100 yards off the point is a rocky islet covered with scrub ; it is about 50 yards in extent at low water, and is then connected with the point.

Watsak point lies on the west side of Saratoga passage, and westward of the point is the beautiful harbour Penn cove, $3\frac{1}{2}$ miles long and one mile wide, with 15 to 7 fathoms water, and heading within $1\frac{1}{2}$ miles of Partridge point ; towards the north are Oak harbour and Duncan bay ; to the north-eastward, just beyond point Demock, is Utsalady. There is deep water along all these shores except off Watsak point, where a narrow shoal extends northward for half a mile. This point is locally known as Snakeland point.

There is a buoy in 4 fathoms about 50 yards off the end of the spit, which has only one fathom upon it at low water.

Polnell point, on Whidbey island, forms the eastern boundary of Duncan bay. Between it and Utsalady the Saratoga passage may be said to end at the turn around Demock point. Locally, Polnell point is known as Miller point.

Utsalady is the most important place on Possession sound : it lies on the north side of Camano island, 27 miles from the southern entrance of the sound. The channel to it through Saratoga passage averages 2 miles wide ; the water is deep, the shores are bold, and there are no known dangers. Vessels are usually towed either way.

Oak harbour and Duncan bay are two bays on Whidbey island, in the north-west part of Saratoga passage. There is the town of Oak harbour at the head of the former. Forbes point is a broad peninsula $1\frac{1}{2}$ miles long, lying between the two bays. Around this broad point is shoal water, and buoys have been placed to enable the steamboats to avoid it in foggy and smoky weather.

LIGHTS.—At Oak harbour, a *fixed white* light is exhibited on the south-east end of Maylor spit, and a *fixed red* light on the north-west end.

At La Conner, a *fixed white* lantern light is shown from a pile on each side of the channel, one-third of a mile from Steamboat slough, Skagit river. A *fixed red* light is shown from a stake at mouth of Stillaguamish river, and a *fixed white* light at the south fork of Stillaguamish river.

NORTHERN SHORE OF JUAN DE FUCA STRAIT.

PORT SAN JUAN, officially known as Port Renfrew, is the first anchorage on the northern shore within the entrance of Juan de Fuca strait. The opening, which is remarkable from seaward, appears as a deep gap between two mountain ranges; the entrance is $13\frac{1}{2}$ miles N.N.E. $\frac{1}{2}$ E. from cape Flattery lighthouse.*

The entrance points lie $1\frac{1}{2}$ miles E. $\frac{1}{2}$ S. and W. $\frac{1}{2}$ N. from each other; the port trends $3\frac{1}{2}$ miles N.E. by N., and is $1\frac{1}{2}$ miles wide, terminating in a beach of muddy sand. Gordon river and Cooper inlet enter the port through this beach; very small coasters enter them towards high water, and find depth and shelter within.

On the western side of the port some rocks and broken ground extend for one mile within Owen point, and nearly 2 cables from the shore; one rock, awash, lies 5 cables N.E. from Owen island, and $2\frac{3}{4}$ cables from the shore. The hill named Pandora peak does not show as a peak within the port.

There is telephonic communication between the station at the mouth of Gordon river and Victoria. Messages will be transmitted at fixed tariff rates.

There is a store, wharf and post office.

Owen point, at the western entrance point, has at about one cable from it a low flat rock named Owen island, awash at high water.

Observatory rocks, off the eastern entrance point (San Juan point), are high pinnacles with two or three trees growing on them, and some smaller rocks off, the outermost of which lies $1\frac{1}{2}$ cables from the shore. At 4 cables within these rocks and $1\frac{1}{2}$ cables from the shore is another reef partly out of water, named Hammond rocks.

Anchorage.—The port is open to south-west winds, and a heavy sea rolls in when a moderate gale is blowing from that direction; and though it is possible that a vessel with good ground tackle would ride out a gale if anchored in the most sheltered part, it is by

* See plan of Port San Juan; scale, $m = 1$ inch. on Admiralty chart, No. 1,911.

no means recommended to remain with any indication of such weather, but to weigh immediately, and if outward bound seek shelter in Neéah bay, the entrance of which lies $10\frac{1}{2}$ miles S. by W. from Port San Juan.

There are depths of from 6 to 9 fathoms all over Port San Juan the bottom fine muddy sand : when within three-quarters of a mile of the head it shoals to 4 fathoms, and here in heavy gales the sea breaks : a flat extends 3 cables from the head. In the outer part of the port there is generally a swell. Good anchorage will be found about $1\frac{1}{2}$ miles from the head in 7 fathoms.

The coast.—From Port San Juan the coast trends east, and presents no very remarkable features ; the country is thickly wooded, and the land rises to a considerable elevation. Providence cove, accessible only to boats, lies 3 miles eastward from San Juan ; at $4\frac{1}{2}$ miles further east is a stream named Sombrio river. Jordan river is $5\frac{1}{2}$ miles westward from Sherringham point ; between the latter and Sombrio river, depths of from 7 to 10 fathoms extend one mile from the shore ; and off Jordan river the latter depth extends about 2 miles.

Eastward, $4\frac{1}{2}$ miles from Sherringham point, is Otter point ; the points on this side of the strait are not remarkable nor easily distinguished unless close in shore, some of their extremes are partially bare of trees. From Otter point, the entrance to Sooke inlet is $3\frac{3}{4}$ miles E. by N. $\frac{1}{2}$ N., the intervening coast forming Sooke bay, in which there is anchorage in fine weather at half a mile off shore in 8 fathoms.

SOOKE INLET, the outer entrance to which, between Parsons and Company points, is three-quarters of a mile wide.

Navigable depths.—The bar has 14 feet on it at low water. Within the bar, the entrance between Whiffin spit and Entry ledge has 7 fathoms, but is only 70 yards across, with a sharp turn and strong tidal streams. Thence a narrow and tortuous channel, $2\frac{1}{2}$ miles in length, leads to a beautiful land-locked basin, 2 miles in extent, east and west, and one mile north and south, with a depth of from 8 to 16 fathoms all over it.*

Independently, however, of strong tidal streams, and several sharp turns, to be made when entering, the width of the channel seldom exceeds half a cable, and is consequently only adapted for coasting

* See Admiralty plan of Sooke inlet, No. 1,907 : scale, $m = 1$ inches.

vessels or small steam-vessels, unless at considerable inconvenience and loss of time.

Beacons.—Three red perches mark the eastern edge of the channel to Sooke wharf, and a black perch marks the west side of the passage, three-quarters of a cable S.W. by W. $\frac{3}{4}$ W. from Trollope point.

Directions.—On the eastern side of the entrance to Sooke inlet is a copper and iron mine. There are also indications of coal in the district.

Whiffin spit is low and gravelly; it must be rounded closely, as Entry ledge lies only half a cable eastward from it. On rounding the point drop the anchor at one cable within, in 8 fathoms.

Anchorage.—There is anchorage outside in 10 fathoms, half a mile off the entrance; or, if necessary, run inside Whiffin spit, where there is sufficient space to anchor; care must, however, be taken as to the depths on the bar, and to the state of the tide in the entrance proper, where the ebb stream at springs runs about 3 or 4 knots.

Tides and tidal streams.—It is high water, full and change, at 2h. 0m. During the winter months the rise of tide in Sooke inlet is said to be 10 feet, and the diurnal inequality being large it appears to be high water during the whole of the day. At the entrance the flood and ebb streams run one hour after high and low water at the rate of 3 to 4 knots during springs.

Secretary island, 120 feet high, small and wooded, lies 4 cables S.E. by E. from Possession point, and one mile south-eastward from Sooke inlet. There is a depth of 16 fathoms between it and the shore, from which it is distant $1\frac{1}{2}$ cables.

BECHER BAY.—Beechey head is a wooded cliff forming the western entrance point of Becher bay; Church point being the eastern; and off the eastern side are several small wooded islands, named Bedford islands. At three-quarters of a mile within in a northerly direction are Wolfe and Frazer islands, with some small islets off them; between these two islands is the channel 4 cables wide. Anchor in 10 fathoms, with the centre of Frazer island bearing S.S.W., distant a quarter of a mile.*

Becher bay cannot be recommended as a good anchorage; there is not good shelter with south-westerly winds, and those outward bound had far better wait a fair wind in Parry bay, 3 miles northward of Race islands.

* See Admiralty plan of Becher and Pedder bays, No. 1,906: scale, $m = 4$ inches.

RACE ISLANDS, a cluster of low, bare rocks, the outermost of which lies one mile S.E. from Bentinck island, occupy a space about half a mile in extent. Great Race is $1\frac{1}{2}$ cables in extent and 28 feet high; the others are smaller, a few feet above high water, or awash. The tidal streams run from 5 to 7 knots, and during bad weather, heavy, dangerous overfalls, and races occur.

In light winds sailing-vessels should give these islands a good berth, especially when eastward of them, as the ebb sets strongly towards them. In 1860 a large vessel was drifted on them by the ebb stream in a calm, and became a total loss.

LIGHT.—From a stone lighthouse, painted in alternate black and white bands, situated on Great Race island, is exhibited, at an elevation of 118 feet above the sea, a *flashing white* light, which shows *one flash every ten seconds*, visible in clear weather 18 miles.

Fog signal.—A steam-whistle is sounded at intervals of 72 *seconds* during thick or foggy weather; the duration of the blast being *five seconds*.

An additional signal to be given in answer to the fog signal of any steam-vessel enveloped in fog in Juan de Fuca strait, and to indicate that the northern portion of that strait is free from fog, as is often the case, is established at Race islands lighthouse. This signal consists of a steam whistle, which, under the above circumstances, will give four short blasts.

Tides and tidal streams.—It is high water, full and change, at Race islands at 3h. 0m.; rise 8 feet. The streams (in August) turn with high and low water by the shore.

Rosedale rock, with 5 feet over it, lies 4 cables S.E. by E. from the Great Race, and uneven ground of 5 to 8 fathoms extends half a mile eastward of the rock.

RACE PASSAGE is 4 cables wide between the Race rocks and Bentinck island, and has shoal heads of 8 and 6 fathoms, nearly in mid-channel. This passage may be taken by a steam-vessel; but under ordinary circumstances it is not recommended for a sailing-vessel, on account of the strength of the tidal streams and races caused by the irregular rocky nature of the bottom.

A case may arise, however, either inward or outward bound, when having a strong S.E. wind it would be better to run through, than to risk weathering the Great Race by less than $1\frac{1}{2}$ miles; if so, the Bentinck island shore should be kept aboard at a distance of 2 cables, or just outside the kelp; *or the northernmost rock, which forms the southern side of the passage, is covered at high water, and the strongest eddies are found in its neighbourhood.

Race passage should not be used by vessels of heavy draught at low water.

Tide race. — Caution. — Heavy tide races occur along the northern shore of Juan de Fuca strait from Esquimalt as far westward as Beechey head.

Bentinck island is about 100 feet high, and, like the adjacent land, covered with pine trees; its southern and eastern sides are fringed with kelp. Between it and the mainland is a boat channel, and coasters acquainted with the locality find shelter at its eastern entrance; there are some settlers' houses in the neighbourhood.*

PEDDER BAY has its entrance immediately northward of Bentinck island, 2 miles N.N.W. of the Great Race rock, between cape Calver and William head, where its breadth is three-quarters of a mile; the inlet takes a W.N.W. direction for 2 miles, narrowing rapidly, and at half a mile up is only fit for small craft, which may find good shelter at its head.†

Anchorage.—Vessels of any size may anchor in the entrance in 7 fathoms, with cape Calver, its southern point, bearing S.E. by S. distant about half a mile; but though the holding ground is good, it is open to winds from N.N.E. round by east to S.S.E., and with a S.E. gale would neither be a desirable nor safe anchorage.

Tides and tidal streams.—The tides are very irregular in this locality. In Pedder bay (in October) the tide at high water was observed to fall about one foot and then to rise again. When the ebb stream had slackened in the offing, the tide rapidly fell in Pedder bay. The ebb stream coming round William head is diverted into Pedder bay and prevents the water from leaving it; Beecher bay is subject to the same irregularities.

* See Admiralty charts:—Haro and Rosario straits, No. 2,689; scale, $m = 0.5$ inch. and Haro strait and Middle channel, No. 2,840; scale, $m = 1$ inch.

† See Admiralty plan of Beecher and Pedder bays, No. 1,906; scale, $m = 4$ inches.

The stream in the offing runs about 2 hours after high and low water by the shore. A south-west wind frequently prevents the water from falling at all.

PARRY BAY, immediately northward from William head, affords good anchorage with all westerly winds. Those bound to sea and meeting with a strong wind from this quarter are recommended to return here. With a south-east wind there is ample room to weigh, which a vessel should immediately do, and if not able to round the Race islands and proceed to sea, run for Esquimalt harbour.

Albert head, the north point of the bay, is moderately high, sloping to the sea, bare of trees at its extreme, but wooded immediately behind; a reef lies one cable off it. William head somewhat resembles it, but is lower.

Anchorage.—The anchorage is in 9 fathoms at from a half to three-quarters of a mile off the sandy beach, with William head bearing S.E. by S. about the same distance.

Quarantine station.—The quarantine station for Victoria is now in Parry bay. The wharf is 480 feet long, with depths of 25 to 30 feet alongside. Two *fixed red* lights, visible 4 miles, are shown from two posts on William head; when bound for the station, proceed northward until these lights are abaft the beam, then westerly until they are in line, which defines the anchorage.

ROYAL BAY or ROADS, of which Albert head is the southern point, and the entrance of Esquimalt harbour the northern limit, is a fine sheet of water 3 miles in extent, affording good anchorage with all winds which would prevent a vessel from entering that harbour.*

Anchorage may be had anywhere within three-quarters of a mile from the western shore. A good berth is one mile South from Duntze head, with the entrance open, or the beacon on Dyke point just open of Inskip rocks (in the harbour); this latter is also the leading mark for clearing the Scrogg rocks when steering in or out.

Coghlan rock, on which there is a depth of 2 fathoms, lies $3\frac{1}{2}$ cables N.N.W. from Albert head; and $3\frac{3}{4}$ cables E.N.E. from the islet at the entrance of the lagoon to the westward. It has deep water around.

* See chart. No. 576.

ESQUIMALT HARBOUR is a safe and excellent anchorage for ships of any size, and with the aid of the light on Fisgard island may be entered at all times. It has been the custom to send a boat to mark the extremity of Duntze head with a light if the night is very dark.*

Constance cove, eastward of a line drawn from Duntze head to Ashe head, is the anchorage for ships of war.

There is daily communication with Nanaimo by rail. The railway terminus is situated in Thetis cove, from which there is an extension to Victoria; and a short branch runs down to a pier, which has been built out from the south point of Thetis cove, near the Indian village, into a depth of 15 feet at low water.

Navigable depths.—The entrance, which bears North, distant $8\frac{1}{2}$ miles from the lighthouse on Great Race island, is between Fisgard island and Duntze head, and is 3 cables wide, opening out immediately within to an extensive harbour having a general depth of 6 fathoms over it, and extending $1\frac{1}{4}$ miles N.W. On the eastern side are Constance cove and Plumper bay, in the former of which built on Duntze head, are the Government Naval establishments.

At one cable above Dyke point (north point of Plumper bay) the water shoals to 3 fathoms, and from thence to the head of the harbour is a flat with only a few feet on it at low water.

LIGHT.—From a white lighthouse situated on Fisgard island (a small rocky islet 25 feet high, and almost connected with the shore, forming the western entrance point of Esquimalt harbour), at an elevation of 67 feet above high water, is exhibited a *fixed* light which shows *white* when bearing from N. 2° W. to N. 60° W.; *red* from N. 60° W. through west to S. 8° E., and *white* from S. 8° E. to S. 50° E., visible 10 miles in clear weather.

Scrogg rocks lie on the eastern side of the entrance 3 cables S.S.E. from Duntze head, and cover at three-quarters flood. Inskip islands kept well open of the head leads clear to the westward of them; but the best mark for entering with a leading wind is the beacon on Dyke point, just open of the rocks off the western end of Inskip islands, bearing N. by W. $\frac{1}{2}$ W., which leads in mid-channel.

Village rocks.—The shoal, with 4 feet on it, lying south of Village rocks, is marked by a red nun buoy. This shoal was

* See Admiralty plan of Esquimalt and Victoria harbours. No. 576; scale, $m = 6$ inches; also Admiralty plan:—Esquimalt harbour, No. 1,897*a*; scale $m = 10$ inches; Constance cove, No. 572; scale, $m = 18$ inches.

formerly the foundation of the T head of Foster's pier, which has fallen into decay, there being now only a portion of the pier standing.

Inskip island.—Rock.—A sunken rock of small extent, with 5 feet on it at low water, lies near the southern shore of Plumper bay, with Dyke point beacon N.W. by N. $\frac{1}{4}$ N., distant 3 cables; and north extreme of Inskip island, E. by N. $\frac{1}{4}$ N. It is marked by a temporary buoy.

There is a depth of 14 feet between this rock and Inskip island.

Whale rock, or White rock, with 7 feet on it, lies 2 cables W. $\frac{1}{4}$ N. from the outer Inskip island, or nearly midway between it and the western shore of the harbour. This rock is of small extent, and not marked by kelp; it has a clear passage on either side, that to the eastward being the wider. Yew point, just touching the light-house on Fisgard island, bearing S. by E. $\frac{3}{4}$ E., leads nearly one cable westward; and Yew point in line with Rodd hill S. $\frac{1}{4}$ E. leads nearly one cable eastward. The rock is marked by a buoy coloured red and black in vertical stripes, moored off its southern side.

Dyke point.—A white pyramidal wooden beacon, 23 feet above high water, is erected on Dyke point (at the head of the harbour).

Anchorage.—The most convenient anchorage is in Constance cove, on the eastern side of the harbour, immediately round Duntze head, the general depth being 6 fathoms, and the holding ground good. There is, however, safe anchorage in any part of the harbour, in not less than $4\frac{1}{2}$ fathoms, as far northward as Dyke point.

Thetis cove, in Plumper bay, on the eastern side of the harbour, immediately north of Constance cove, is a snug anchorage in $4\frac{1}{2}$ fathoms, with the harbour entrance just shut in by Inskip rocks; but vessels proceeding above these rocks must take care to avoid Whale rock.

Moorings and buoys, for the use of H.M. ships, occupy the central part of Constance cove; and along the northern shore are lesser moorings for boats and small vessels. One cable off the dock entrance are two buoys for docking purposes. And eastward of the town pier there are other buoys used as moorings for small craft.

The depth at the outer end of Dockyard jetty is 15 feet at low water.

A direct south wind, to which some parts of the harbour are open, seldom blows, and there is never sufficient swell to render the anchorage inconvenient.

Observation spot.—Duntze head flagstaff is in lat. $48^{\circ} 25' 49''$ N., long. $123^{\circ} 26' 45''$ W.

DIRECTIONS.—After rounding Race island lighthouse, distant $1\frac{1}{2}$ miles, the lighthouse on Fisgard island will be seen; a course N. $\frac{1}{2}$ W. direct for it will clear all dangers, but attention must be paid to the set of the tidal streams.

The ebb stream runs almost directly from the Haro and neighbouring straits towards the Race islands, and, unless with a commanding wind, sailing-vessels should give them a wide berth, and steer N.E. by N. for 3 or 4 miles, before bearing up for the harbour. The flood sets N.E., and with light winds vessels are liable to be carried to the eastward, and if near to the Vancouver island shore, they may be set up the Haro channel, where the water is generally too deep for anchorage; therefore, with the flood, the coast of Parry bay should be kept aboard if possible, where good anchorage may be had in moderate weather, and with all westerly winds, at less than one mile from the shore in 10 fathoms.

When entering the harbour under sail with a strong fair wind, take care to shorten sail in time, as the space for "rounding-to" is somewhat limited; and it is desirable to moor if any stay is intended, as the winds are changeable.

The best time for sailing-vessels to leave the harbour is early in the morning, when either a calm or light land wind may be expected; there is little strength of tide in the harbour, or for some distance outside, and it sets fairly in and out.

Caution.—Fisgard island should not be passed within one cable distant, as a rock with 7 feet over it lies three-quarters of a cable N.E. from the lighthouse.

By night, when Fisgard island light bears N. by W., steer for it. Keep the *white* light in full view; if it becomes dim or shaded, the shore is being too closely approached, when immediately haul out to the eastward until it is again distinctly seen; the two lights (Race and Fisgard) by their bearings will show how the vessel is being affected by the tides.

The *white* light is intended to guide in from seaward, and while visible clears alike the western coast between Race island and Esquimalt, and the off-lying dangers, Scrogg rocks, and Brotchy ledge, between Duntze head and Trial island. The *red* light will be found useful by those bound to Victoria or Esquimalt from the eastward; after rounding Trial island it will indicate a vessel's distance from the shore, and if bound to Esquimalt, a W.S.W. course will lead a safe distance outside Brotchy ledge, until the light changes from *red* to *white*, when it may be steered for, and not before.

Entering Esquimalt harbour, Fisgard island light should be left from one to two cables on the port hand; when it bears N.W. by W. $\frac{1}{3}$ W. the light changes from *white* to *red*, and shows the latter colour within the harbour; and when it bears S. by W. at a convenient distance, a vessel may anchor in 7 fathoms, or stand into Constance cove if preferred. The Scrogg rocks on the eastern side of the entrance of the harbour must be avoided; they lie nearly 4 cables E.S.E. from Fisgard island.

Dock.—The graving dock is 450 feet long over all, and 430 feet on the blocks; 65 feet wide at the entrance, with a depth of $26\frac{1}{2}$ feet over the sill at high water ordinary spring tides. This dock is closed by a caisson which, if necessary, can be placed on the outer side of the outer invert, giving an additional length to the dock of 30 feet.

H.M.S. *Warspite*, drawing 26 feet, was docked on 18th July 1891, the depth on the sill that night was $28\frac{1}{2}$ feet. See tides, page 12.

The Admiralty have the right of priority of use of the Esquimalt dock.

There is a marine railway capable of taking up a ship of 2,500 tons.

Repairs to large machinery can be effected also to the hull of iron ships. Two tons of metal can be run at one time; cylinders of 30 inches can be cast and bored; shafting of 6 inches can be forged and turned, a 3-in. shaft up to 21 feet length; pipes of any size can be brazed, masts made and boats built.

Sheer legs lift 25 tons, small crane lifts 2 tons, and 20-ton crane about to be erected. The wharf is 83 feet long, with a depth of 16 feet alongside at low water.

Supplies, with the exception of fresh beef and bread, must be obtained from Victoria.

A fresh water service is laid on at the dock ; the charge is 60 cents per 1,000 gallons.

Coal is weighed at the mines and sent down as required. Vessels of about 25 feet draught can coal alongside Thetis island wharf.

Vessels can coal alongside Esquimalt wharf ; on the eastern side of which there is a depth of 25 feet at low water. Or coal can be taken on board at all times from colliers or lighters.

Electric telegraph.—Esquimalt is in telegraphic communication with England through Canada, by way of Nanaimo and Burrard inlet. Also through the United States, by way of Seattle.

Tides.—At Esquimalt harbour and in the vicinity there is no regular establishment. There are two tides in the lunar day for about half of each fortnight, and one tide in each lunar day for the other half, and this appears to be the case throughout the year. Springs rise 7 to 10 feet, neaps 5 to 8 feet. *See also page 12.*

Winds.—The strongest and most frequent gales blow from south-west and south-east, which are leading winds in, but rarely from N.W. The south-west is a summer wind, generally fresh, and brings fine weather, unless it blows a gale. South-east winds may be looked for during the winter months, or between November and March, and generally a strong gale once a month with rain and thick weather. The north-east wind rarely blows with much strength, and always brings fine clear weather.

VICTORIA HARBOUR, 2 miles eastward from Esquimalt, has its entrance between Ogden and Maclaughlin points. Macaulay point, a remarkable projection nearly midway between the two harbours, is a bare flat point about 30 feet high, showing as a yellow clay cliff, worn by the action of the sea and weather into a rounded knob at the extreme. The coast for one mile on either side of this point is fringed with sunken rocks, and is dangerous for boats in bad weather, many fatal accidents having occurred.†

Navigable depths.—The entrance to the harbour is shoal, narrow, and intricate, and with south-west or south-east gales a

† *See Admiralty plan :—Esquimalt and Victoria harbours, No. 576 ; scale, m = 6 inches ; also Victoria harbour, No. 1,897b ; scale, m = 10 inches.*

heavy rolling swell sets on the coast, which renders the anchorage outside unsafe. Vessels drawing 14 or 15 feet may, under ordinary circumstances, enter at high water; and ships drawing 17 feet have entered, though only at the top of spring tides.

At the entrance of the harbour, on the southern side of Shoal point, there is a wharf which is used by the San Francisco steamers. The pier is 600 feet in length and has a depth of 23 at low water. Along the eastern side of the harbour in front of the town there are about 400 yards of fair wharfage, with a depth of from 10 to 16 feet at low water spring tides.

Pilots.—There are pilots attached to the port, who keep a good look out for vessels off the entrance. Pilotage is compulsory to all merchant vessels, except coasters.

Pilots are seldom met with below Race rocks; but between January and July, in moderate weather, those approaching Juan de Fuca strait, and requiring a pilot, may obtain a man competent to take them to Royal roads or port Townsend from the schooners engaged in the seal fishery off the coast, between cape Beale and Clayoquot sound, at from 5 to 20 miles from the land.

Sometimes in Neéah bay a pilot may be had if a gun is fired twice in quick succession. Guns are used by the sealing schooners in foggy weather, but only once in 10 or 15 minutes, so that a gun fired twice in quick succession would not be mistaken.

LIGHTS.—From a white lighthouse 30 feet high, situated on Berens island (west side of Victoria harbour), is exhibited, at an elevation of 44 feet above the sea, an *occulting white* light, with a period of *twenty seconds*, thus:—light, *fifteen seconds*; eclipse, *five seconds*; visible in clear weather 10 miles. It shows a *red* sector over Brochy ledge, between N. 31° W. and N. 36° W.

Fog signal.—A bell is rung during thick or foggy weather, in reply to signals from those approaching the harbour.

Shoal point spit beacon consists of three piles, painted red, from the top of which a *fixed red* light is shown, visible in clear weather 3 miles.

Pin rock beacon consists of three piles, painted black, from the top of which a *fixed white* light is shown, visible in clear weather 3 miles.

See chart, No. 1,897b.

As these two beacon lights are not constantly watched they cannot be implicitly relied on.

Brotchy ledge.—About 5 cables from Holland point, and in the fairway to Victoria harbour from the eastward, lies the Brotchy ledge with 5 feet on its shoalest part; it is about one cable in extent within the 5-fathoms line. The tidal stream, at its maximum strength, sets towards Brotchy ledge at a rate of about 3 knots an hour

This shoal is marked by a platform buoy, coloured red and black in horizontal stripes, moored on the shoal. The buoy is occasionally washed away during the heavy winter gales.

Fisgard island lighthouse, north part of Brothers island, and Macaulay point in line bearing W. $\frac{1}{2}$ N., leads one cable northward or the ledge in 9 fathoms, between it and the shore; and Fisgard island lighthouse, just open southward of Brothers island bearing W. by N. $\frac{1}{4}$ N., leads 2 cables southward of the ledge in 21 fathoms.

A beacon with red and white horizontal stripes is in course of construction on Brotchy ledge. From this beacon an electric light will be exhibited.

Anchorage.—When anchoring outside the harbour to wait tide, or from other causes, do not come within a line between Ogden and Maclaughlin points; this is a good stopping place with off-shore winds or fine weather, but is by no means recommended as a safe anchorage for sailing-vessels during the winter months, when bad weather comes with little warning.

Beaver rock, situated 250 yards N.E. $\frac{3}{4}$ E. from Laurel point, has a depth of 9 feet over it at low water.

Directions.—The entrance to Victoria harbour being only 2 miles eastward from Esquimalt, the same precautions as regards the tides (*see* page 73) must be observed when making for that harbour; during daytime Victoria District church, a conspicuous white building with a spire, standing on an eminence, will be seen shortly after rounding Race islands, bearing N. by E. $\frac{1}{4}$ E.; it should be kept just on the starboard bow.

At night or during bad weather it is strongly recommended not to run for this harbour, as it can only be entered at certain stages of the tide, and the anchorage outside is at such times exposed and

unsafe, while Royal bay, or Esquimalt harbour are always available and safe; but if it is decided to run for Victoria, it must be borne in mind that when Fisgard island light changes from *white* to *red*, a vessel will be very near the shore.

The channel is buoyed (*see* page 14), but it is necessary for a stranger to take a pilot; when within, the port is perfectly landlocked, and vessels may lie in from 14 to 18 feet at low water, but the harbour accommodation is limited.

Tides.—For all practical purposes the tides are the same as at Esquimalt. *See* page 80.

VICTORIA, the seat of the government, has a considerable foreign and coasting trade. The resident population according to the census taken in 1891 was 16,841, and the town has made great progress since 1858, when it may be said to have first sprung into existence; it now covers a large extent of ground, substantial and handsome stone and brick buildings everywhere replacing the wooden structures first erected. Victoria has excellent educational institutions, hospitals, and library, and the streets are lighted by the electric light.

Harbour and pilot dues are charged; and there are sick mariners' dues of 2 cents a ton register three times a year on vessels of 100 tons and upwards, and once a year on vessels under 100 tons.

Instances have been known of shocks of earthquakes being felt at Victoria.

Between Victoria and Quatsino sound, medical assistance can only be obtained at Alberni.

Supplies.—Provisions of all kinds may be procured, and water from a floating tank capable of going outside the harbour.

Coal is weighed at the mines and sent down as required, but a large quantity is not kept in store. Vessels can coal alongside the wharves in the harbour, and also from the wharf on the south side of Shoal point.

Patent slip.—There are slips on which vessels of 1,000 tons can be hauled up.

See chart, No. 1,897b.

Repairs can be effected to large machinery. There are steam hammers and lathes to turn shafting 10 inches diameter and 20 feet long; pipes of any size can be brazed; cylinders of any diameter up to 10 tons can be cast and bored; 12 tons of metal can be run at one time. Sheers lift 30 tons. Boilers can be made, masts and boats can be built.

Quarantine.—There is a quarantine station for persons affected with infectious diseases; and a hospital for seamen who are recommended for admission by masters of vessels that have paid sick mariners' dues.

The quarantine station is in Parry bay. The wharf is 480 feet long, with depths of 25 to 30 feet alongside. *See* page 75.

Telegraph.—A submarine telegraph cable crosses Georgia strait and connects the city with the mainland of British Columbia, and another crosses Juan de Fuca strait to Washington territory.

Communications.—There is steam communication with San Francisco every five days; and with Alaska every fortnight throughout the year; a tri-weekly service to the east coast of Vancouver island, and a daily service to Port Moody, except on Mondays; and steamers run daily, except on Sundays, to the ports in Puget sound. There is daily communication with Nanaimo by rail. There is a fortnightly mail service between Victoria, Port Renfrew, Alberni, Ucluelet, Clayoquot and Ahousat; and monthly from Victoria, Hesquiat, Nootka, Kyuquot, and Quatsino.

Victoria to Burrard inlet.—The best route from Victoria to Burrard inlet is south of Trial and Discovery islands, through the main channel of Haro strait, and northward of Stuart and Waldron islands into Georgia strait. Only those with good local knowledge should attempt to navigate the inner channels.

The COAST from Victoria harbour trends easterly for $1\frac{1}{2}$ miles to Clover point, and is for the most part faced by white sandy cliffs, from 10 to 80 feet high; over a sandy beach, and at one cable off, in many places are rocks and foul ground. Two cables East from Holland point are Glimpse reefs, which cover at three-quarters flood.

See chart, No. 576.

Beacon hill, a gentle rise of the land near the coast, and one mile East from Victoria harbour, is 140 feet high, grassy, and no trees.

Clover point, at 2 miles eastward from the entrance to Victoria harbour, is low, bare of trees, and projecting; it is steep-to, and off it strong tide rips form, which are dangerous to boats. Ross bay, eastward of it, is open, but sometimes used by small craft waiting tide.*

Telegraph.—The submarine telegraph cable connecting Vancouver island with the United States is laid from Clover point to New Dungeness.

Foul bay, nearly one mile N.E. from Clover point, is of small extent and filled with rocks. Off its entrance are the Templar rocks, with a depth of about 4 feet on them.

Foul point, on the eastern side of Foul bay, is rocky, but the land at the back of the point rises to a height of 230 feet, forming a rocky ridge known as Gonzales hill.

TRIAL ISLANDS, nearly $1\frac{3}{4}$ miles eastward from Clover point, are two in number, bare and rocky, but they generally appear as one. The southern or larger island is 80 feet high, and steep-to at its outer end; the northern one is low, and from it foul ground extends some distance. Strong tide ripples prevail off the southern island, especially during the flood, which runs nearly 6 knots at springs just outside it.

INNER CHANNELS.—The inner channels leading from Juan de Fuca strait into the Haro strait are the Enterprise, Mouatt, Mayor, and Baynes channels, and Hecate and Plumper passages. These channels should not be used by strangers.*

Enterprise channel, between Trial islands and the Vancouver shore, is tortuous, but much used by steam-vessels and coasters trading to Victoria harbour, as a slight saving of distance is effected, and less tidal stream experienced than by going southward of the Trial islands; it is about one mile long, and half a cable wide, in the narrowest place, and there are not less than 24 feet water in the shoalest part.

* See Admiralty chart:—Inner channels, from Juan de Fuca strait to Haro strait. No. 577; scale, *m* = 6 inches.

McNeil bay, on the northern side of the channel, eastward of Foul point, is 3 cables in extent, with from 2 to 6 fathoms; and foul ground exists in its eastern part, but the bay is much used by small vessels waiting tide.

Mouatt reef, in the eastern part of the channel, nearly 2 cables off shore, is about one cable in extent, and covers at quarter flood; this reef is dangerous, as it lies just northward of the fairway. McNeil farm, just open west of Kitty islet, a bare yellow rock 4 feet high on the eastern side of McNeil bay, bearing W. $\frac{1}{2}$ N., leads half a cable southward of Mouatt reef; and Channel point, in line with the west side of the Great Chain islet bearing N. by E. $\frac{1}{4}$ E., leads nearly 2 cables eastward of it.

BRODIE ROCK, a patch of 3 fathoms, lies nearly one mile N.E. $\frac{1}{4}$ N. from the summit of south Trial island. The northern point of small Trial island in line with Foul point bearing W.S.W. leads $1\frac{1}{2}$ cables northward of Brodie rock.

Foul point seen between the Trial islands bearing W. $\frac{3}{4}$ S. leads $2\frac{1}{2}$ cables southward of the rock.

Cadboro point in line with the east extreme of Great Chain island bearing N. by W. leads $2\frac{1}{2}$ cables eastward of the rock.

GONZALES POINT forms the south-east extremity of Vancouver island. It is low, rocky, bare of trees, and steep to on the eastern side.

Oak bay.—From Gonzales point, the Vancouver shore trends northward, and at one mile from the point forms a sandy bay which affords fair anchorage.

The best anchorage is northward of Mary Todd islet in the southern part of the bay. This islet is bare, and about 30 feet high; at 2 cables eastward from it is Emily islet, 4 feet above high water, and the same distance southward from Emily islet lies Robson reef, which uncovers at low water.

Cadboro bay, 2 miles northward from Gonzales point, is about half a mile in extent, and open to south-east; no sea, however, rises within it, and there is good anchorage in from 3 to 4 fathoms near the entrance. The Vancouver shore from Gonzales point to this bay is low and lightly timbered with dwarf oak and pine trees.

Thames shoal, of 2 fathoms, is of small extent ; it lies nearly half a mile N. by E. $\frac{3}{4}$ E. from Gonzales point. Channel point, in line with the western side of Great Chain islet bearing N. by E. $\frac{1}{4}$ E., leads one cable eastward of this shoal ; and the highest part of Trial island in line with Gonzales point bearing S. $\frac{3}{4}$ W. leads half a cable westward of it.

Mayor channel, northward of Gonzales point, and westward of Chain islets, is about 2 miles long in a winding direction to the northward, its breadth in the narrowest part is 3 cables, and the depths in it vary from 6 to 13 fathoms. The tidal streams seldom run more than 3 knots through this channel, and it is the one generally used.

Lee rock, which uncovers at low water springs, lies $1\frac{1}{2}$ cables W.N.W. from Thames shoal ; it is steep-to on the eastern side. Between this rock and Thames shoal is Mouatt channel, one cable wide.

Fiddle reef, at the north-west extreme of Mayor channel, and upwards of one mile from Gonzales point, is of small extent, and awash at high water springs.

A beacon, consisting of a white conical structure, surmounted by a black pole and cage, stands on Fiddle reef.

Todd rock, at $1\frac{1}{2}$ cables W.N.W. from Fiddle reef, in the entrance to Oak bay, covers at two-thirds flood.

Lewis reef, at the north-east part of Mayor channel, lies $2\frac{3}{4}$ cables N.W. from Great Chain islet, and covers at high water. Between it and Chain islets the ground is foul.

A beacon, consisting of a cylindrical stone tower, coloured black, and surmounted by a cross, stands on Lewis reef.

Chain islets, midway between Discovery island and the Vancouver shore, are a bare rocky group. Great Chain islet is about one cable in extent and 30 feet above high water ; it lies at the south-west side of the group.

Spencer ledge, off their eastern side at $1\frac{1}{2}$ cables from the easternmost high-water rock, has 9 feet on it ; if going through Hecate passage it requires to be guarded against. Cadboro point, open westward of Channel point N.N.W. $\frac{2}{3}$ W., leads one cable eastward of this ledge.

Caroline reef, at the northern part of the group, and connected to it by a rocky ledge, is small and covers at quarter flood, but is well out of the fairway. Foul ground extends upwards of one cable westward from it.

DISCOVERY ISLAND is 2 miles N.E. from Gonzales point, at the junction of the Haro and Juan de Fuca straits. It is wooded, about three-quarters of a mile in extent, and its shores on all sides are bordered by rocks, extending in some places more than 2 cables off. Rudlin bay, on its south-east side, is filled with rocks, and should not be used by any vessel.

A rock with 9 feet over it lies with Seabird point bearing N. by E. $\frac{3}{4}$ E., distant 4 cables. Another rock with 15 feet over it lies close N.N.W. of the above rock.

LIGHT.—From a white lighthouse 47 feet high, situated on the east extreme of Discovery island, is exhibited, at an elevation of 91 feet above high water, a *fixed white* light, visible between the bearings N. 31° E., through west, and S. 42° E., visible in clear weather 15 miles.

Fog signal.—A steam horn is sounded for 8 seconds followed by one minute silence.

CHATHAM ISLANDS, north-west of Discovery island, and separated from it by a narrow boat pass, are of small extent, low, wooded, and almost connected with each other at low water; the tidal streams set with great strength between them.

Leading point, the south extreme, is a bare rocky islet at high water; to the eastward of it is a small boat cove. Channel point, their west extreme, is also bare and steep-to.

Strong Tide islet, the north-western of Chatham islands, is rocky, about 50 feet high, and wooded; its western side forms the eastern boundary of Baynes channel, and is steep-to.

Refuge cove, on the eastern side of Chatham islands, is small, and has a depth of $1\frac{1}{2}$ fathoms in the centre; coasters or small craft entangled among these islets may find shelter in it. Alpha islet, the easternmost of the group, is bare, and 10 feet above high water; only a boat should attempt to go westward, or inside it.

Fulford reef, 3 cables North from the Chatham islands, is about one cable in extent, and covers at one-third flood. When using Baynes channel keep well to the westward to avoid this reef, as the tidal streams set irregularly in its vicinity.

Hecate and Plumper passages.—Discovery island is separated from Chain islets by a passage half a mile wide, forming an apparently clear channel; but near the middle of the southern part lies Centre rock, which has 3 feet over it. There is a passage on either side of this danger, the western named Hecate, and the eastern Plumper passage. The latter is wider, but the tidal streams set very strongly through both of them.

Cadboro point, open westward of Channel point bearing N.N.W. $\frac{2}{3}$ W., leads through Hecate passage in mid-channel, westward of Centre rock.

Baynes channel, between Cadboro point and the Chatham islands, is one mile long and half a mile wide; the depths in it are irregular, and the tidal streams at springs set through it 4 to 6 knots, strongest along the eastern side.

Five-fathoms shoal, which lies in the centre of the channel, is not marked by kelp. Nearly one cable N.W. from it is another shoal with 16 feet on it; it lies $3\frac{3}{4}$ cables E.N.E. from Jemmy Jones islet. To avoid it, keep a little over on either side of mid-channel.

CADBORO POINT, on Vancouver island, at the termination of the Inner channels, is nearly 3 miles North from Gonzales point, and three-quarters of a mile N.W. from the Chatham islands. It is about 50 feet high, rocky and bare of trees. A small islet lies just off it, also a reef which covers; when passing do not approach the islet within 2 cables.

The coast west from Cadboro point to Cadboro bay is low, very much broken, and there are some off-lying rocks.

Jemmy Jones islet, which is bare and 15 feet above high water, lies 3 cables off shore, and $4\frac{1}{2}$ cables S. by W. from Cadboro point; foul ground extends around it for upwards of one cable in some parts, and none except small craft should go between it and the shore.

Directions.—Though the Inner channels are deep, they should not be used except by steam-vessels, or by small craft, unless in cases of necessity, and a knowledge of the tide is indispensable.

Coasters and small steamers, when taking advantage of them, generally proceed through Mayor channel. If using this channel, after passing Gonzales point keep the western side of Great Chain islet in line with Channel point bearing N. by E. $\frac{1}{2}$ E. till within 2 cables of the islet, when the north end of Mary Todd island will be in line with the north point of Harris island and the vessel will be clear of the Thames shoal, after which steer to the north-west, bringing the highest part of Trial island in line with Gonzales point bearing S. $\frac{3}{4}$ W., and with that mark on astern, steer N. $\frac{3}{4}$ E., which will lead between Fiddle and Lewis reefs, and on through Baynes channel, to Haro strait, taking care, however, to avoid the patch of 16 feet lying close to the Five-fathoms shoal, as this mark leads only half a cable westward of the patch.

When past Lewis and Fiddle reef, steer N.N.E., and pass out of Baynes channel between Five-fathoms shoal and Strong Tide islet.

Going through Mouatt channel, which is very narrow and seldom used, after rounding Gonzales point one cable distant, bring the highest part of Trial island in line with the point bearing S. $\frac{3}{4}$ W., and keeping this mark on astern, and steering N. $\frac{3}{4}$ E., will lead through clear of danger.

Hecate and Plumper passages are nearly straight. If using either of them, after passing either through Enterprise channel, or southward of Trial islands, bring the leading marks (page 89) on, and keep them so till northward of Centre rock, when steer up in mid-channel between Chain islets and Chatham islands, N.W. by W., towards Cadboro bay, and through Baynes channel into Haro strait.

Tides and tidal streams.—The high water at full and change is irregular and much influenced by prevailing winds; the greatest rise and fall of tide at Discovery island is 12 feet.

During summer months in these channels, the flood stream commences at 11.15 a.m., running with great strength till nearly 3 p.m., after which but little stream is felt till 4 a.m. on the following day, when the ebb commences and runs strongly till nearly 11 a.m., the time of low water by the shore.

CONSTANCE BANK, in Juan de Fuca strait, nearly 6 miles S.E. by E. from Fisgard island lighthouse, is upwards of one mile in extent, with depths of from 9 to 14 fathoms, but do not anchor on it as the bottom is rocky.*

FONTE BANK, known also as Hein bank, within the depths of 10 fathoms, is about $1\frac{1}{2}$ miles in extent; it has depths of from $3\frac{1}{2}$ to 5 fathoms on it, and lies nearly in the middle of Juan de Fuca strait, 8 miles E. by S. from Discovery island light. This bank should be avoided, as there may be less water on it than shown in the chart.

HARO STRAIT, the westernmost of the three channels leading from Juan de Fuca strait into Georgia strait, is bounded on the western side by Vancouver island, and its off-lying smaller islands and reefs, and on the eastern side by San Juan and Stuart islands, and trends in a N.W. by N. direction for 18 miles; it then turns sharply to the N.E. round Turn point of Stuart island, for a further distance of 12 miles, leaving Saturna island to the westward, and Waldron and Patos islands to the eastward, when it enters Georgia strait.*

It is for the most part a broad, and for its whole extent a deep navigable ship channel; but on account of the reefs which exist in certain parts, the general absence of steady winds, the scarcity of anchorages, and, above all, the strength and varying direction of the tidal streams, much care and vigilance is necessary in its navigation, and it is far more adapted to steam than to sailing-vessels.

Besides Haro strait thus described, there are several channels and passages branching from it by which vessels may enter Georgia strait; thus, Swanson channel leads into the strait by Active pass, and the Trincomali and Stuart channels by Portier pass, or Dodd narrows.

These channels may be again entered by smaller ones; thus, Sidney and Cordova channels, on the western side of Haro strait, lead by Moresby, Colbourne, and Shute passages into Swanson, Satellite, and Stuart channels, and finally into Georgia strait. These channels are essentially adapted to steam navigation, or to coasting vessels; they afford smooth water, and many of them anchorages.

* See Admiralty chart:—Haro strait and Middle channel, No. 2,840; scale, *m* = one inch.

Middle bank, lying in the southern entrance of Haro strait, 4 miles E. by N. from Discovery island, and almost in mid-channel, is a rocky patch about 2 miles in extent each way, and the least water found on it is 10 fathoms. In bad weather there are heavy tide ripples on and in the vicinity of this bank, which are dangerous to boats or small craft.

Zero rock, one of the principal dangers in the southern part of Haro strait, lies on the western side of the strait, is about half a cable in extent, and covers at three-quarters flood; it lies $6\frac{1}{2}$ miles N.W. from Discovery island light.

A rocky patch, part of which nearly uncovers at low water springs, lies $3\frac{1}{2}$ cables N.N.W. $\frac{1}{2}$ W., from Zero rock.

Discovery island light is obscured in the direction of Zero rock, and westward of it.

The beacon on this rock is the frustum of a cone in stonework above which rises a pole surmounted by open slat-work in the form of a triangle, point upwards. The top is 28 feet above high water.

Kelp reefs, three-quarters of a mile in extent, lie almost in the centre of Haro strait, 7 miles N.N.W. $\frac{1}{4}$ W. from Discovery island light. They uncover at low springs.

The eastern edge of the reefs is marked by a stone beacon 20 feet high, with staff and globe. The buoy previously marking the reefs has been withdrawn.

Darcy island.—A shoal patch of 3 fathoms lies northward of Darcy island, with Whale rock and South Dot rock in line.

Unit rock lies three-quarters of a mile E. by N. $\frac{1}{2}$ N. from the south-east point of Darcy island, and uncovers 2 feet at low tides.

Bare island well open northward of the south-east point of Sidney island, bearing N.W. $\frac{1}{4}$ W., leads eastward of Kelp reefs and Unit rock.

Anchorage.—Although there are harbours in Haro strait and its tributary channels, the number eligible for sailing-vessels overtaken by darkness, or an adverse tide, is small.

Between Cormorant bay and the northern entrance of Haro strait, Plumper sound and Cowlitz bay are the only eligible stopping places for a sailing-vessel seeking shelter.

Stuart island has two fair harbours, and Roche harbour at the north-west end of San Juan island is a suitable anchorage for steam-vessels or small coasters, but no sailing-vessel of moderate tonnage could enter either under ordinary circumstances without great loss of time, as well as risk.

CAUTION.—As previously mentioned on pages 16 and 26, seamen are again cautioned that, when navigating the inner waters of British Columbia, it should be constantly borne in mind that many of the main channels and most of the minor passages have only been roughly examined; detached boulders from the broken shores and pinnacles of rock are still frequently found. Whenever, therefore, a broad and clear channel is known to exist, there is no justification in using, without necessity, one of more doubtful character, even if there is some saving in distance, and a ship should always be maintained in the safest possible position in a channel as well as when going in or out of port.

DIRECTIONS.—Haro and Georgia straits.—After rounding Discovery island, distant one mile, steer N.N.W. $\frac{1}{4}$ W., or for Kellett bluff, a remarkable steep rocky headland. In working up, when standing westward, tack when the north-west extreme of Low island comes in line with the south-east point of Sidney island, which will give the Zero rock a good berth; but when approaching the Kelp reefs, Bare island must be kept well open eastward of the same point to avoid them.

When abreast Kellett bluff, at from half a mile to one mile distant, a N.W. by N. course will pass the same distance from Turn point of Stuart island. There are no known dangers off this point; but whirling eddies and tide rippings, caused by the meetings of the streams from so many channels, are generally met with, particularly on the ebb. A vessel may reach this point with a fresh southerly wind, but will almost invariably lose it here, until having opened out Middle channel eastward of San Juan.

After rounding Turn point, a N.E. $\frac{1}{2}$ N. course for 10 miles leads to the northern entrance of Haro strait, between the East point of Saturna and Patos islands. This passage is $2\frac{1}{2}$ miles wide, but is

subject to heavy tide rippings and eddies; when possible pass through the centre of it, steering for the white cliffs of point Robert.

Orcas Nob, well open eastward of Waldron island bearing S.S.E. $\frac{1}{4}$ E., leads through in mid-channel; do not bear away westward until the south end of Sucia is shut in with south end of Patos island.

At night, after passing between Saturna and Patos islands, maintain a northerly course for about 2 or 3 miles, and then if the light on Georgina point, at the entrance to Active pass, is not visible, steer N.W. until it is sighted, remembering that this light becomes obscured when it bears southward of W. $\frac{1}{2}$ S., and, as whilst it is in view all dangers on the southern shores of the strait will be avoided, be careful to keep it in sight and by no means stand southward of the above line of bearing.

The flood stream from Rosario strait, which is met with as soon as the passage between Orcas and Sucia islands is open, is apt to set a vessel towards the East point of Saturna, off which and Tumbo island there is much uneven and broken ground with heavy tide races. This point should be given a berth of $1\frac{1}{2}$ miles, taking care to avoid a dangerous rock lying $7\frac{1}{2}$ cables N.N.E. from Race point, Tumbo island.

The ebb stream sets eastward even before Georgia strait is well open, and if not likely to weather Patos, pass between it and Sucia, where there is a good clear passage of above one mile wide; if this passage is taken, the Patos island shore should be kept rather aboard. Beware of the Plumper and Clements reefs; the former lies $1\frac{1}{2}$ miles S.W. by S. from the north-west bluff of Sucia island, and has 10 feet on it; the latter the same distance N.E. $\frac{1}{2}$ N. from the same bluff, and has 8 feet over it.

When in Georgia strait, from W. by N. to W.N.W. is a fair mid-channel course. If bound for Fraser river, a N.W. by W. course from the centre of the channel between Patos island and East point of Saturna will lead to the Sand heads, a distance of nearly 20 miles. Entering the strait and having passed northward of Patos island, if the ebb stream is running, a sailing vessel is extremely liable, unless with a commanding breeze, to be set eastward and down Rosario channel.

The northern shore of Sucia island should by all means be avoided; if Alden bank can be reached it offers a good anchorage while

waiting for a tide. Alden point, the west point of Patos island, in line with Monarch head, a bold cliffy bluff, bearing S.W. $\frac{1}{2}$ W., leads over the northern edge of this bank in from 6 to 9 fathoms. (*See* view A on chart 2,689.) When mount Constitution is in line with the centre of Matia island, bearing S.S.E. $\frac{1}{4}$ E., a depth of 9 fathoms may be expected, and do not anchor in much less than this depth, as in the shoaler parts, rocky ground is found ; the least water on the bank is $2\frac{1}{2}$ fathoms.

Against a foul wind and ebb stream work up on the northern shore ; there are no known dangers, little stream when eastward of a line between Roberts point and Alden bank, and anchorage may always be had within one mile of the shore if necessary. Birch and Semiahmoo bays offer good anchorage, and are easy of access. In working up Georgia strait the southern shore should never be approached within 2 miles until westward of Active pass, and then not within one mile ; the tides sweep strongly along this shore, and there are several outlying reefs between East point and Active pass.

As soon as the strait is entered from the southward, Roberts point will show its eastern part as a bold white-faced cliff, its western as a low shingle point ; its summit is covered with trees, and it would at first sight be taken for an island in consequence of the land on its northern side falling rapidly in elevation. After passing northward of this point, its low-water extreme, or the trees just within it, must not be brought to bear southward of E. $\frac{1}{2}$ S. to avoid Roberts bank, which extends 5 miles off Fraser river entrance, is steep-to, and shoals suddenly from 25 to 2 fathoms.

Tidal streams.—The tidal streams set fairly through the main channel of Haro strait, outside Kelp reefs, and inside them through Cordova and Sidney channels ; passing outside Kelp reefs and eastward of Sidney island, a part of the flood stream branches eastward between San Juan and Stuart islands, and there meeting the flood from Middle channel, cause heavy races and eddies, so that although there are deep water channels between these islands, they are not recommended for sailing-vessels. In like manner the flood runs N.W. between the group of islands, northward of Sidney island, and through Shute and Moresby passages, though the main stream will be found to run fairly between Stuart and Moresby islands.

JOHNSTONE REEF, on which there is a depth of 5 or 6 feet, lies three-quarters of a mile from the shore, midway between Cadboro point and Gordon head; it is of small extent. A rock, on which is a depth of 2 fathoms, with 11 to 20 fathoms around, lies $2\frac{1}{2}$ cables S.S.W. from the south-eastern rock of Johnstone reef, with Cadboro point bearing S.E.

CORMORANT BAY, between Gordon and Cowitchin heads, on the western side of Haro strait, is a good stopping-place and easy of access under most circumstances. It may be entered either to the southward or northward of Zero rock; the passage to the southward is $1\frac{1}{2}$ miles in breadth, with a depth of 20 fathoms. Mount Douglas, a remarkable hill 696 feet high, with its summit bare of trees, rises immediately over the coast at the head of the bay.

Three shoal patches, with from 6 to 12 feet water on them, lie from one to $1\frac{1}{2}$ miles W. $\frac{1}{2}$ S. from Zero rock, but there is a clear passage of nearly one mile in width, with 20 fathoms water, between the rock and the nearest shoal.

The tidal streams are not much felt in Cormorant bay when westward of Zero rock, and the holding ground is good.

This anchorage is exposed to S.E. winds, but a vessel with good ground tackle will always be perfectly safe.

PLUMPER SOUND.—If necessary to anchor in Haro strait between Stuart island and the east point of Saturna island, Plumper sound is recommended as safe and convenient, easy of access with the wind from any quarter. The entrance lies 5 miles N.N.E. $\frac{1}{2}$ E. from Turn point, and an equal distance from Saturna lighthouse. Blunden (Douglas) island,* close to the shore of Pender island, with only a boat passage (choked with rocks and kelp) between, forms the western entrance point; Monarch or Java head (Saturna island), a high bold rocky headland, the eastern. There is anchorage in a moderate depth of water in most parts of it, and little tide is felt.

The water is too deep for convenient anchorage, the first two miles being generally from 25 to 50 fathoms, except on the southern side, where if necessary an anchor may be dropped at a quarter of a mile from the shore, in from 10 to 12 fathoms.

* It is stated that a local pilot obtained a cast of 22 feet in the tide rip charted at $1\frac{1}{10}$ miles East from Blunden island. In 1895 a line of sounding was taken over this spot from H.M.S. *Nymphe*, when no bottom was obtained at 70 fathoms.

See chart, No. 2,840.

At 2 miles within the depth decreases rather suddenly to 10 fathoms, and excellent anchorage may be had in almost any part; the most convenient is off the entrance to port Browning on the southern side in 8 fathoms, at half a mile from the shore, with the eastern point of Blunden island just open of the land westward of it, bearing E. $\frac{1}{2}$ S.

A rocky patch of small extent, with 16 feet on it, and steep-to, lies on the eastern side of Plumper sound, with Croker point $2\frac{3}{4}$ cables E. by S. The western extreme of Fane islet, in line with the north-east extreme of Pender island, leads south-westward of the patch.

Above port Browning avoid Perry rock, with 6 feet on it; it is 2 cables from the shore, and three-quarters of a mile N.W. by N. from Razor point.

Port Browning is on the southern side of Plumper sound; it is one-third of a mile wide, but rather less at the entrance. The depth decreases from 10 fathoms at the entrance to 4 fathoms at its head, with good holding ground. The best anchorage is in the centre just above Shark cove, which is a convenient creek, with 4 fathoms in it, on the southern side of the harbour, three-quarters of a mile within the entrance; here a ship might beach and repair on a sandy spit.

Shark cove is separated from Bedwell harbour by an isthmus 150 yards wide, across which the natives launch their canoes.

Lyll harbour is in the south-east corner of Plumper sound, and its southern entrance point, Elliot bluff (cliffy), bears N. $\frac{1}{2}$ E. distant 2 miles from the entrance to Port Browning. King islets two low rugged islets, with a reef extending nearly one cable off their western end, form the northern entrance, which is half a mile wide. The harbour trends easterly $1\frac{1}{4}$ miles, gradually narrowing and terminating in a sandy beach with a stream of good fresh water at its head; the depths decrease regularly from 8 to 4 fathoms.

Crispin rock, with 6 feet on it, is a pinnacle, exactly in the middle of the harbour, half a mile E. by S. from outer King islet; there is, however, a clear passage on either side of it $1\frac{1}{2}$ cables wide, and when anchoring above it, drop the anchor in 5 fathoms, at half a mile from the beach at the head of the harbour.

The anchorage outside Crispin rock is with outer King islet bearing N.W. by N., distant one-third of a mile, in 7 fathoms, muddy bottom.

Boot cove, on the southern side of the harbour, has 3 fathoms water, and is a convenient spot for repairing a vessel; a small islet lies off its western entrance point.

Samuel island, between Saturna and Mayne islands, is almost connected with both, but leaving two passages by which boats or even small coasters may pass into Georgia strait at proper times of tide.

Winter cove is between Samuel island and the north-west point of Saturna. The depths being from 2 to 3 fathoms it is only fit for small vessels. Coasting vessels might take the passage at slack water, or boats overtaken in the strait by bad weather might take shelter under the lee of Belle chain, and enter Plumper sound by this pass on the flood tide.

Water is easily obtainable during the winter or rainy months from streams in almost any part of Plumper sound. At the head of Lyall harbour or port Browning, constantly in the former, a certain quantity may be procured during the driest months of summer from June to August.

NAVY CHANNEL is a continuation of the western part of Plumper sound, and leads to Georgia strait or Fraser river by Active pass; or to Nanaimo, or any of the north-western ports of Vancouver island.

Conconi reef lies about midway through Navy channel, $1\frac{1}{2}$ miles from Fane island, and nearly 2 cables off the northern shore, and narrows the strait at that part to one-third of a mile. It is a ledge of rocks extending in the direction of the channel for more than one cable, covering at half tide; and a patch of 2 fathoms extends nearly 2 cables westward from it. The general depth of water in the channel is from 20 to 30 fathoms.

Enterprise reefs are two rocky patches, the westernmost of which is covered at a quarter flood. The outermost of these reefs lies one mile W.N.W. from Dinner point, the north-west entrance point of Navy channel. A patch of 2 fathoms lies 2 cables E.S.E. from the westernmost rocky patch.

Beacon.—A white beacon 22 feet above high water stands on Enterprise reef, near its western extremity; to the pyramidal framework of the beacon are fixed two disks at right angles to each other.

Directions.—When using Navy channel, keep rather southward of mid-channel. When bound through Trincomali channel or Active pass, steer over towards Prevost island until Pelorus point (the east point of Moresby island) is open of Mouatt point (the west point of Pender island), bearing S.E. $\frac{1}{2}$ S.; then haul up N.W. $\frac{1}{2}$ N., keeping the marks just open, which will lead over one-third of a mile to the westward of Enterprise reefs. See View C, on chart No. 2,840.

When Helen point, which is a low bare yellow point, bears N. by E., or the northern beacon comes well open westward of the southern one, steer for the entrance of Active pass, or shape course up the Trincomali channel.

Tidal streams.—The flood stream from the Swanson channel runs through Navy channel to the eastward, and meets the flood in Plumper sound, causing a slight ripple at the eastern entrance; its strength is upwards of 3 knots.

BEDWELL HARBOUR, the entrance to which lies 3 miles westward from the southern entrance of Plumper sound, is, on account of its narrow entrance, not so eligible a stopping place for waiting the tide as the latter; but for steam-vessels it is a good harbour. Its narrowest part, which is at the entrance, is a quarter of a mile wide, but it soon opens out to half a mile, and trends W.N.W. for 2 miles, with depths of from 5 to 10 fathoms, mud bottom.

The only known danger which does not show is Drew rock, with 10 feet on it, in the centre of the harbour, one-third of a mile from its head; there is, however, no necessity to go as far up as this.

The most convenient anchorage is in a bay on the northern shore, two-thirds of a mile within the entrance, in 8 fathoms, midway between Hay point and Skull reef; the latter always shows some feet above high water.

Camp bay, between Bedwell harbour and Plumper sound, and half a mile westward of Blunden island, offers shelter as a stopping place to small craft, when not convenient for them to work into either of these ports.

See chart, No. 2840.

STUART ISLAND, 3 miles N.W. from the northern part of San Juan island, is 3 miles long in an east and west direction, and 642 feet high, the summits of the hills being partially bare of trees.

There are two anchorages in Stuart island, Reid harbour on its southern side, and Prevost harbour on its northern, but both are small and intricate for sailing-vessels larger than coasters. Turn point, the north-west extreme of Stuart island, is a bold cliffy bluff.

LIGHT.—Turn point light is *fixed white* of small power, exhibited from a white staff 35 feet above high water.

The fog signal house, and the keeper's dwelling, each painted white with brown roofs, are situated close south-eastward of the light staff.

Fog signal.—Turn point fog signal is a Daboll trumpet, which during thick or foggy weather gives blasts of *three seconds* duration, separated by silent intervals of *twenty seven seconds*.

Reid harbour.—When entering Reid harbour from the southward, beware of being drawn by the flood stream into the channel between San Juan and Stuart islands, where there are several dangers, and the tidal streams are most irregular in their direction. The south-west side of Stuart island should, therefore, be first closed.

The harbour is one mile N.W. from Spieden bluff (a remarkable bare grassy point, generally of a yellow colour), the western extreme of the island of the same name. Gossip island lies in the entrance, from which a shoal extends $1\frac{1}{2}$ cables W. by N.; leave it on the starboard hand when entering. The channel is $1\frac{1}{2}$ cables wide with depths of from 4 to 5 fathoms. The best anchorage is off an Indian village on the southern side at about half a mile within the entrance.

Prevost harbour, on the northern side of Stuart island, $1\frac{1}{2}$ miles eastward from Turn point, has James island lying in the centre of it. The entrance is westward of this island, between it and Charles point, and is about 2 cables wide.

Anchor in 6 fathoms as soon as the eastern arm opens out, or run up the arm into $4\frac{1}{2}$ fathoms; here it is narrow, but perfectly sheltered.

There is no ship passage eastward of James island.

Johns island lies eastward of Stuart island, separated from it by a navigable channel narrow and not recommended.

Several islets and rocks, all above water, extend three-quarters of a mile S.E. from the eastern end of Johns island; the southernmost of these are named Cactus islands. Gull reef, 2 feet above high water, lies half a mile W. $\frac{3}{4}$ N. from Cactus islands; rocks extend easterly from it more than one cable.

SPIEDEN ISLAND, lying between San Juan and Stuart islands, is $2\frac{1}{2}$ miles long in an east and west direction, and very narrow; its southern side grassy and bare of trees, its summit and northern side thickly wooded; Green point, its eastern extreme, is a sloping grassy point.

There is a channel on both sides of Spieden island; but from the strength and irregularity of the tidal streams, and the hidden dangers which exist in certain parts of them, they cannot be recommended for sailing-vessels, nor indeed to any vessel without a pilot.

Spieden channel, between Spieden island and San Juan, has a general W. by S. and E. by N. direction. Sentinel island lies in the western entrance of this channel, it is about 150 feet high; the passage between it and Spieden island is more than one cable wide with a depth of 25 fathoms. When using Spieden channel keep Spieden island shore aboard, and pass between it and Sentinel island. There is much less tide here than in the centre of the channel, or on the San Juan shore. Sentinel rock lies 2 cables W. by N. $\frac{1}{2}$ N., from the island.

Centre reef is a dangerous patch, awash at low water, lying almost in the centre of the channel, half a mile S.W. by S. from Sentinel island. Both the flood stream from Haro strait, and the ebb stream through Spieden channel set on to the reef; therefore, when nearing it, the San Juan shore should be kept aboard, avoiding the shoal which lies $1\frac{1}{2}$ cables N. by W. $\frac{1}{4}$ W. from Bare islet.

Danger shoal has 2 fathoms on it, and lies three-quarters of a mile S.S.W. $\frac{3}{4}$ W. from Spieden bluff. Bare islet, a rock about 15 feet high, lies in the southern part of the channel, one mile E. by N. $\frac{1}{2}$ N. from Morse island. A shoal patch of 15 feet lies nearly $1\frac{1}{2}$ cables N. by W. $\frac{1}{4}$ W. from the islet; depths of from 3 to 5 fathoms extend

nearly 2 cables westward from the patch. A black can buoy in 6 fathoms marks the north-west extreme of the shoal ground.

Directions.—Bound eastward through the Spieden channel, pass about a quarter of a mile northward of Morse island, and then steer N.E. by E. $\frac{1}{2}$ E. for Green point (the east extreme of Spieden island) until Sentinel island bears N.N.W.; the dangers in the western entrance will then be passed, and a straight course may be steered through; bearing in mind that less tide will be found near Spieden island shore.

Bound westward through this channel, if the passage between Spieden and Sentinel islands is not taken, the shore of Spieden island should be kept aboard to avoid the tide races. If Centre reef is awash, or the kelp on it is seen, pass a quarter of a mile south of it, and steer to pass the same distance northward of Morse island. If Centre reef is not seen, take care not to bring Morse island to bear southward of S.W., until Bare islet bears S.E.

New channel northward of Spieden island, though narrower than the one just described, is deep, more free from danger, and the navigation of it more simple; the channel is a quarter of a mile wide between Spieden and Cactus islands, and care should be taken not to get entangled among the reefs northward of the latter.

The flood stream sets north-eastward among them; but it also sets fairly through New channel, and by keeping the Spieden island shore aboard, there will be no danger of being set to the northward; the ebb stream runs south-westward between Spieden and Johns islands.

SAN JUAN ISLAND, the western coast of which forms for some distance the eastern boundary of Haro strait, is 13 miles in length in a N.W. and S.E. direction, with an average breadth of about 4 miles. Its western coast is steep and rocky, and affords no anchorage. Mount Dallas rises abruptly 1,086 feet, but the eastern side of the island falls in a more gentle slope, and affords a considerable extent of good land available for agricultural or grazing purposes.

Towards the southern end, and visible from seaward, are some white buildings, the farming establishment of the Hudson bay company; the south-eastern extreme terminates in a white clay cliff, over which rises mount Finlayson to a height of 550 feet,

remarkable as being entirely clear of trees on its southern side, while it is thickly wooded on the northern. There is a clean gravel beach under mount Finlayson, where boats can generally land.

Off the north-west end of San Juan lies Henry island, only separated from it by a narrow channel (Mosquito passage); it might be easily taken for a part of San Juan, the passage appearing merely as an indentation in the latter.

Open bay has more the appearance of a channel than Mosquito passage. There is no shelter in the bay, or anchorage in the passage, for anything but coasters.

Mosquito passage trends in a northerly direction for 3 miles, is a little over half a mile in breadth, and is studded with numerous reefs. Westcott creek branches off N.E., and affords a haven for coasters. There is a 2-fathoms channel through the passage, and into this creek.

Roche harbour, between San Juan and Henry islands, is landlocked, and half a mile in extent with depths of from 6 to 8 fathoms over the greater part of it. It must be entered from the northward by others than small craft; its entrance is somewhat confined, but not very difficult of access, and it affords good shelter when within

The breadth of the entrance between Inman point (Henry island) and the shore of Pearl island is over 2 cables, but the navigable channel is contracted to little over half a cable by shoal water which extends off both shores. A stranger must not count on more than 24 feet at low water when rounding in.

Morse island, a small flat cliffy island, about 30 feet high, lies a quarter of a mile W.N.W. from the north point of Henry island.

Pearl island, about 4 cables long east and west, and $1\frac{1}{2}$ cables broad, and wooded, lies in the centre of the passage, forming two entrances, the eastern of which, however, is barred; off the northern side of Pearl island is a small islet (Neck) connected to it at low water.

Scout patch, a dangerous spit projecting from Inman point, has 17 feet on it; and although there is a depth of 5 fathoms in mid-channel, great care must be exercised to avoid this patch by those drawing over 14 feet.

* See Admiralty plan of Roche harbour and approaches, No. 602; scale, $\frac{1}{4}$ inch = 6 inches.

A good anchorage is in 6 fathoms, with the western end of Pearl island N.W., distant about a quarter of a mile, and the north part of Henry island just open of it. If working in, remember that a shoal of 15 feet lies $1\frac{1}{2}$ cables northward from Bare islet.

The time of high water at full and change in Roche harbour is irregular ; springs rise 12 feet.

WALDRON ISLAND lies in the northern entrance of Middle channel, but as its anchorages are frequently available for vessels passing to or from Haro strait, it seems desirable that it should be described while treating of that neighbourhood.

The island is thickly wooded, moderately high, and cliffy on its southern and eastern sides, but falling to the northward, where it terminates in low sandy points. Disney point, its southern extreme, is a remarkable, high, stratified bluff.

Cowlitz bay, on the western side of Waldron, between Disney and Sandy points, affords good anchorage with all winds, the depth of water from 3 to 8 fathoms, and the holding ground stiff mud ; it may be sometimes more desirable for sailing-vessels to anchor here than to work 2 or 3 miles up into Plumper sound, particularly for those coming up Middle channel. If a south-easter is blowing, stand far enough in to get smooth water under shelter of Disney point ; no sea, however, to affect a vessel's safety gets up in this bay with any wind.

Mouatt reef, with a depth of 3 feet on it, lies half a mile N.W. $\frac{1}{2}$ N. from Disney point.

If entering from the southward, Disney point should be kept within less than half a mile, particularly on the ebb, for as soon as Douglas or President channel (the continuation of Middle channel) is opened out, through which the streams set sometimes at the rate of 5 knots, a vessel is apt to be set down on Danger rock.

White rock, fronting Cowlitz bay, is 35 feet high, and bare, it has a sunken reef extending 2 cables N.W. from it.

Danger rock, with 5 feet on it, and on which the kelp is rarely seen, lies one-third of a mile S.E. by E. $\frac{1}{2}$ E., from White rock.

Caution.—It is particularly recommended to give these rocks a wide berth, as with the strong tides, the water is too deep for anchorage in case of getting entangled among them in light winds.

North bay, on the north-west side of Waldron island, affords anchorage in 8 to 10 fathoms about a quarter of a mile off shore, but is not by any means such a desirable place as Cowlitz bay, the bank being rather steep, and the tidal streams more felt.

SATURNA ISLAND and PATOS ISLAND, between which is the northern entrance to Haro strait just described, are marked by lights.

LIGHTS.—**Saturna or East point light** is *revolving white*, attaining its greatest brilliancy every *thirty seconds*, visible between N. 39° E., through west, and S. 59° E., it is 140 feet above the sea, and visible in clear weather 18 miles.

The lighthouse, painted white, with a red lantern, is square in shape.

Patos or Alden point light is *fixed red* of small power.

Fog signal.—A trumpet on Patos point gives blasts of *two seconds*, followed by a silent interval of *eighteen seconds*.

See chart, No. 2,840.

CHAPTER III.

THE WESTERN CHANNELS AND ISLANDS TO
GABRIOLA PASS.

Variation 23° to 24° East, in 1898.

The **WESTERN CHANNELS** of **HARO STRAIT** may be used with advantage by steam-vessels or coasters bound from the southern ports of Vancouver island to Georgia strait, or to the districts Saanich, Cowichin, Nanaimo, and the numerous intermediate harbours; the advantages over the Haro strait consist in the strength of tide being less, besides sheltered anchorage being obtainable in almost all parts; while in the latter strait the depth of water is so great that it is impossible to anchor, and sailing-vessels may frequently be set back into Juan de Fuca strait, thus entailing great delay as well as risk.*

On the other hand, the western channels are not free from danger, yet, with the assistance of the chart, and a good look-out from aloft for kelp, a precaution which should never be neglected, they may be navigated during daylight with ease and safety.

SIDNEY CHANNEL, between James and Sidney islands, is the best; it is nearly one mile wide, with depths of from 14 to 20 fathoms, until near its northern end, where shoal patches with only 6 to 9 feet water on them, marked by kelp, lie 3 to 5 cables off the western point of Sidney island.

Whale islet, a small rock 6 feet above high water, lies at the southern entrance to Sidney channel, and is joined to Sidney island by a sand spit. Sidney spit, the north-west end of the island, is a low sandy tongue with a few trees on its extreme. There is good anchorage off this spit in 8 fathoms water.

* See Admiralty chart:—Haro and Rosario straits, No. 2,689; scale, $m = 0.5$ inches; also Admiralty chart:—Haro strait and Middle channel, No. 2,840; scale, $m = 1.0$ inch.

A spit, with a depth of 3 fathoms, extends in a northerly direction from the north-east point of James island. North-westward of the spit, the depth increases quickly to 5 and 9 fathoms.

A sunken rock, with a depth of 20 feet on it and deep water around, is situated about one cable from the western coast of Sidney island, with the beacon at the north-west point of Sidney island bearing N.N.W. $\frac{3}{8}$ W., distant $13\frac{1}{2}$ cables.

Beacon and buoys.—A beacon consisting of a cone 40 feet high, surmounted by a pole and cage 10 feet high, the whole coloured white, has been erected on Sidney spit.

A black spar buoy, shewing 10 feet above water, marks the south-east extreme of the two 3 fathoms patches west of Darcy island.

A buoy, coloured red and black in horizontal bands, is moored in 16 feet on the south-eastern of the two rocky patches off the north-west part of Sidney island.

Sidney.—The town Sidney is situated on the coast about $1\frac{1}{2}$ miles southward of Shoal harbour. Shoal ground, with general depths of $1\frac{1}{4}$ to 4 fathoms, extends about 3 cables in an east and south-east direction from the town. The outer edge of the shoal ground is marked by two red spar buoys.

Northward of Sidney, a shoal with 9 feet at its outer extreme and 4 to 7 fathoms close eastward, extends about 3 cables from the coast. From the extreme the wharf at Sidney bears S. by W. $\frac{3}{4}$ W. about $3\frac{1}{2}$ cables.

Cordova channel between James island and Vancouver island is a fair passage with little tide; it is not, however, to be preferred to Sidney channel, neither is any saving in distance gained by taking it, and it cannot be recommended for vessels drawing over 14 feet, as the navigable channel at its southern entrance between the banks extending off from the south-west bluff of James island and the main island shore is only 3 cables wide, and has a sand bank over one cable in extent, with 15 feet water on it lying in the centre of the passage.

A little northward from Cowitchin head, low swampy land extends 2 miles N.N.W., and about a quarter to half a mile off the high land; shoal water extends from one to 2 cables outside this flat.

The southern face of James island is a moderately high and steep white clay cliff, its summit covered with trees; towards the eastern part of this cliff are two remarkable notches on its summit. A bank, having from one to 3 fathoms water on it, extends one mile to the eastward, and nearly half a mile to the southward and westward from the south-west bluff of James island. A shoal three-quarters of a mile in extent, having depths of from $1\frac{1}{2}$ to 3 fathoms on it, lies south-eastward from the island, the centre of it bears S.E. by E. $\frac{1}{2}$ E., distant $1\frac{1}{4}$ miles from south-west bluff James island.

Directions.—If the passage inside Discovery and Chatham islands has been taken, and intending to take the Sidney channel; when abreast Cadboro point, steer N.N.W., keeping the passage between that point and Chatham islands open astern, until mount Tuam (on the southern point of Admiral island) is in line over the centre between the two remarkable notches on James island bearing N.W. by W., *see* View D, on chart No. 2,840. This mark will lead nearly one mile eastward from Zero rock, 3 cables westward from the 3 fathoms patches off Darcy island, and between them and the shoal of 9 feet extending south-eastward from James island.

When Morse island is in line with the south-east point of Sidney island, bearing N.E. $\frac{3}{4}$ N., alter course to N.N.W., to avoid the shoal which extends one mile E. by N. $\frac{1}{2}$ N., from south-west bluff of James island; pass about 3 cables westward from Whale islet, and then steer up mid-channel, and avoid the shoal patches off the west end of Sidney island, but not by shutting Whale islet in with Darcy island, until the end of Sidney spit bears North.

If passing outside Discovery and Chatham islands, at about one mile off shore, steer N.W. $\frac{1}{2}$ N., until the leading marks (mount Tuam in line between the two remarkable notches on James island, bearing N.W. by W.) are on, when proceed as before directed.

MINERS CHANNEL.—Low and Bare islands are two small islands lying off the eastern side of Sidney island, and between them and the latter there is a good passage, half a mile wide, with 8 fathoms least water; a 3 fathoms patch one cable in extent lies $2\frac{1}{4}$ cables N. by E., from the east point of Sidney island, the southern entrance of the channel. This channel may prove convenient for those having passed up Haro strait eastward of Kelp reefs, and desiring to take the inner channels to Saanich, Cowitchin, or through Stuart channel.

After passing Bare island a course should be steered between Sidney spit and Jones island. Having passed to the northward of Sidney island, either by Cordova, Sidney, or Miners channels, the Shute or Moresby passages may be taken as convenient; if bound for Saanich Cowitchin, or through Stuart channel, the former is preferable while the latter offers a more direct course through the Swanson or Trincomali channels, or to Fraser river by Active pass.

The eastern side of Sidney island affords good anchorage in 8 fathoms, out of the tide, off a bay S.S.W. from the north end of Bare island; the bay is shoal as far out as a line between its entrance points.

Midway between Low and Bare islands, and on the line, between their north-west points, is a reef which uncovers; and a rock which nearly uncovers lies 4 cables N. $\frac{1}{2}$ W., from the north-west end of Low island. There is a rock 3 feet above high water bearing W. by N. $\frac{1}{2}$ N., distant one-third of a mile from the north-west end of Bare island.

Shute passage.—To enter this passage, after leaving Sidney spit, pass between Jones island and the Little group, then eastward of Coal island, Knapp and Pym islands, and between Piers and Portland islands, when the Satellite channel will be entered, which leads directly to Saanich, Cowitchin, and the western parts of Vancouver island. This is a good clear channel, and with the assistance of the chart may be used with much facility.

Jones island lies two-thirds of a mile North from Sidney spit, with a clear passage between of from 15 to 20 fathoms; shoal rocky ground extends one cable westward from the north-west point of Jones island, and the tides set with considerable strength (2 to 5 knots) round this point; detached rocks extend 2 cables eastward from the east end of the island.

Tree, Hill, Domville, Comet, and Gooch islands which lie in the fairway between Sidney and Moresby islands, are moderately low, and wooded, but the passages between them are not recommended unless to those well acquainted with the navigation of this locality.

North Cod reef is about 2 cables in extent, and covers at a quarter flood, it lies 4 cables S. $\frac{1}{2}$ E. from the west end of Gooch island.

South Cod reef, also about 2 cables in extent, has 6 feet on it at low water, it lies 7 cables S. $\frac{1}{2}$ E., from the west end of Gooch island; both reefs are marked by kelp.

A patch of 2 fathoms, marked by kelp, lies nearly midway between the southern end of Jones and Domville islands; the passage between Gooch and Comet islands is filled with kelp.

The Little group lies two-thirds of a mile W. by N. from Jones island. They consist of four rocky islets, one-third of a mile in extent, east and west, bare of trees, and connected by reefs; there is a good passage of 12 fathoms water between them and Jones island.

Bird islet, lying on the eastern side of Shute passage, and two-thirds of a mile N.N.W. from the north point of Jones island, is about 6 feet above high water, and has a cluster of reefs around it one cable in extent, marked by kelp; between it and Coal island there is a clear passage one mile wide, with from 20 to 30 fathoms water.

Coal island, which helps to form the western side of Shute passage, lies close off the north-east extreme of the Saanich peninsula, and immediately at the entrance of Shoal harbour; it is one mile in extent and thickly wooded.

When working up the passage between Bird islet and Coal island, a vessel should not stand to the westward of a line joining the east end of Little group to the east point of Coal island, as a rock which covers at a quarter flood lies 4 cables W.N.W. from the east end of the group.

A small patch with 4 fathoms over it, and probably less marked by kelp, lies one mile N.E. from the east point of Coal island, more than three-quarters of a mile N.N.W. $\frac{1}{2}$ W. from Bird islet, and one-third of a mile S.W. from Yellow islet. When abreast the east point of Coal island, and distant one-third of a mile, a W.N.W. course will lead through Shute passage in mid-channel, passing eastward of Pym island, off the eastern side of which a reef which uncovers extends a little more than one cable.

As patches of kelp have been seen extending some distance from the south side of Pym island, caution must be observed when passing between that island and Coal island.

Celia reef, which lies between Pym and Portland islands, must also be avoided. The least water found on it is 8 feet; it is marked by kelp, and lies two-thirds of a mile North from the north point of Pym island.

Yellow island kept just open northward of Sentinel island, bearing E. $\frac{1}{4}$ S., leads more than one cable southward of Celia reef; and Beaver point (Admiral island), in line with Steep bluff (Portland island), bearing N. $\frac{1}{2}$ W., leads westward of it.

Knapp and Pym islands are small and wooded, lying between Piers and Coal islands. The passage between Piers and Portland islands is over one mile in breadth; about one cable off the eastern side of Piers island is a rock always uncovered; and a reef extends from the western side of Knapp island. Having passed westward between these islands a vessel is fairly in Satellite channel.

Cape Keppel, in line with Cowitchan head, W. $\frac{1}{4}$ S. southerly, leads through Colburne passage in 8 to 10 fathoms between the two buoys.

MORESBY PASSAGE.—After leaving the northern end of Sidney island, the directions for Moresby passage are the same as these already given for Shute passage, until abreast the east point of Coal island. From about one-third of a mile off this point the direct course through the passage is N. $\frac{1}{2}$ W. (Canoe rock beacon same bearing) for $2\frac{1}{4}$ miles, or, until Beaver point is in line with the easternmost Channel islet in Ganges harbour, bearing N.W. $\frac{1}{2}$ N., this mark will lead midway between Turnbull reef, and the Canoe rocks, which extend off Portland, and Moresby islands, narrowing the channel at its northern entrance to little over one-third of a mile.

The Sisters, off the eastern point of Portland island, are three rocky islets, about 25 feet high, have a few stunted cedar trees on their summits, are joined by reefs, and will be immediately recognised either from the northward or southward.

Turnbull reef.—Eastward from the Sisters, at more than one-third of a mile, extends Turnbull reef in a semicircular direction towards the north-west point of Portland island, and almost joining it; 2 fathoms is the least water found on its outer edge, and it is marked by a bank of kelp, which, however (on account of the tide), is not always visible until close to it.

Canoe rocks is a dangerous ledge extending nearly half a mile W. $\frac{1}{4}$ N. from Reef point, the north-west point of Moresby island; the outer rock of this ledge covers a little after half flood, and is not marked by kelp, though kelp grows between the point and the rock.

A stone beacon 25 feet high, surmounted by a cross and coloured black, stands on the Canoe rocks.

A black can buoy is moored on the rock at the western extreme of the reef extending from Reef point, Moresby island. Between the buoy and the point there is a rock with $1\frac{1}{2}$ feet over it.

Directions.—With the beacon on Canoe rocks visible, the passage is easy, as the above dangers may be passed as close as convenient, and there are 11 fathoms in mid-channel; but if the beacon is not visible, which may sometimes happen, then it is desirable when coming from the southward to borrow on the Moresby island shore, passing Seymour point, the western cliffy point of the island, distant 2 cables.

PREVOST PASSAGE is between Moresby island and the group of smaller islands southward of it.

To those passing up the main stream of Haro strait and bound for Swanson channel, the easiest and most direct route is between Stuart and Moresby islands; but circumstances of wind or tide may render it convenient to take Prevost passage; for instance, with light winds the ship may be set into the passage by the flood, or, if near to Moresby island, by the ebb tide from the upper part of Haro strait, which runs here, as it does in all other parts of the channel, from $2\frac{1}{2}$ to 3 hours after low water by the shore, sets westward among the small islands, and down the Miners and Sidney channels.

Arachne reef.—The dangers to be avoided in Prevost passage are Arachne and Cooper reefs. Arachne reef lies nearly in the centre of the passage, in a direct line between Fairfax point (the south-east point of Moresby island) and Tom point (the east point of Gooch island); and $2\frac{1}{4}$ miles S.W. by W. $\frac{1}{2}$ W. from Turn point of Stuart island. This reef covers at a quarter flood, and has a good deal of kelp on its north-west edge, which, however, is frequently run under by the tide.

Cooper reef, lying half a mile N.W. by N. from Tom point (Gooch island), is marked by kelp, and uncovers at half ebb; there

is a passage one mile wide between it and Arachne reef, the channel being about the same width between the latter and Moresby island, with deep water.

North part of Portland island, in line with south side of Moresby island, bearing W. by N. $\frac{3}{4}$ N., leads northward of Cooper and Arachne reefs.

Yellow islet, a small bare islet 8 feet high, lies $1\frac{1}{2}$ miles S.W. by W. from Fairfax point, and should be passed on the north side to clear the shoal of 3 fathoms which extends nearly 2 cables westward from the islet.

SATELLITE CHANNEL is formed by Admiral island on the north: and Moresby, Portland, and Piers islands, and the northern shore of Saanich peninsula on the south. It leads to Saanich inlet, Cowitchin harbour, and by Sansum narrows to Stuart channel. It is a good, deep passage with but few dangers, which are not always visible; among these are Shute reef and Patey rock. The general breadth of the channel is one mile, deep, and the strength of tide from one to 3 knots.

Shute reef is a ledge less than half a cable in extent, with two rocks, one of which is covered at 8 feet flood, its vicinity being marked by kelp. It lies two-thirds of a mile W.S.W., from Harry point, the north point of Piers island, and nearly 3 cables N. by E. $\frac{1}{4}$ E., from Arbutus, a small islet, with two or three of the red stemmed arbutus growing on it, and lying half a mile westward from Piers island.

Patey rock, at the western end of Satellite channel, is a single rock, covered at 6 feet rise, with kelp around it, and is in the way of vessels working into Saanich inlet or Cowitchin harbour. It lies two-thirds of a mile N.N.E. from Hatch point, the westernmost point of Saanich inlet; nearly 2 miles N.W. by W. $\frac{1}{4}$ W., from Coal point, a remarkable nob point, the south extreme of Deep cove; and $3\frac{1}{3}$ miles S.W. by W. $\frac{1}{2}$ W. from Arbutus islet.

Harry point open northward of Arbutus islet, bearing N.E. by E., leads 3 cables southward of Patey rock; and the high round summit of Moresby island, well open northward of Arbutus islet, bearing E.N.E., leads $3\frac{1}{2}$ cables northward of it.

See chart. No. 2,840.

Cecil rock, with 2 fathoms on it, lies one-third of a mile E.S.E. from the south point of Russell island at the entrance of Fulford harbour, and must be avoided when working up Satellite channel.

Boatswain bank, on the western side of the channel, off the Vancouver shore, between Cherry and Hatch points, affords good anchorage in from 4 to 9 fathoms, sandy bottom; the outer edge of the bank in 10 fathoms is steep-to, it extends three-quarters of a mile E. by N., from Cherry point, and then trends S.S.E., over three-quarters of a mile; from $1\frac{1}{2}$ to 3 cables inside the 10 fathoms line, the water shoals rapidly from 5 to 3 fathoms, the latter depth being found 4 cables from the shore.

SAANICH INLET is a deep indentation extending in a nearly S.S.E. direction for 14 miles, and carrying deep water to its head, which terminates in a narrow creek within 4 miles of Esquimalt harbour. A rocky patch, about half a cable in extent north-east and south-west, with a least depth of 8 feet on it, lies with the western White rock off Cole bay, bearing N. 57° E., distant 2 cables.

The inlet forms the south-east portion of Vancouver island into a peninsula of about 20 miles long in a N.N.W. and S.S.E. direction, and varying in breadth from 8 miles at its southern part, to 3 at its northern.

Off the eastern or peninsula side of the inlet there are some good anchorages, the centre being for the most part deep. Immediately southward from James point (the north-western point of the peninsula), is Deep cove, but no convenient anchorage.

Norris rock, awash at half tide, lies 2 cables S.W. by S. from James point, with 12 fathoms between it and the point. When rounding this point, give it a berth of half a mile.

Union bay, at 2 miles southward from James point affords good anchorage in 8 or 9 fathoms, half a mile from the beach; a shoal bank extends 2 to 3 cables from the shore around the bay. There is a stream of fresh water in the south-east corner of the bay.

Cole bay, $1\frac{1}{2}$ miles southward from Union bay, and immediately under mount Newton is small, but capable of affording shelter to a few vessels of moderate size; off its north point are White rocks, two small bare islets. Anchor in the centre of the bay in 8 fathoms, with White rocks bearing W.S.W. These bays are somewhat open to S.W. winds, but a gale rarely blows from this quarter, nor from the proximity of the opposite shore, distant scarcely 3 miles, could much sea get up.

Tod creek is 2 miles southward from Cole bay. Senanus island, a small wooded islet, 150 feet high, lies off its entrance, foul ground extends nearly one cable off the north-west side of the island.

A small islet, and a rock lying one cable north from it, lies in the entrance to the south-east part of the creek. A short distance inside it narrows rapidly and winds to the southward and south-east for three-quarters of a mile, with a breadth of less than one cable, carrying 6 fathoms nearly to its head.

There is anchorage in the outer part of the creek in 15 fathoms.

Squally reach.—From Willis point, the western point of Tod creek, the inlet known as Squally reach trends south-west for $2\frac{1}{2}$ miles, the breadth of the arm here being three-quarters of a mile, with no bottom at 100 fathoms. Finlayson arm, its continuation, trends S. by E. $\frac{1}{2}$ E. for 3 miles, and terminates Saanich inlet.

Beacon rock, which covers at three-quarters flood, lies one cable, S.W. $\frac{1}{2}$ S., from Elbow point, Finlayson arm. A small islet named Dinner, with deep water on either side, lies near the head of this arm, $1\frac{1}{2}$ cables southward from which there is good anchorage in 9 fathoms. At 3 cables south from the islet, the arm terminates in a flat, which dries at low water. Immediately over the head of the inlet, on the eastern side, Leading peak rises to an elevation of 1,346 feet.

Mill creek bay is a fair anchorage, and the only one on the western side of Saanich inlet; a bank of sand and rock which has only from one to 3 fathoms water on it, extends 2 cables from the western shore, across the bay; a large stream flows into the north-west corner of the bay. A rock, with only 6 to 9 feet water on it, lies almost in the centre of the bay, a short distance outside the 3 fathoms line, nearly 4 cables S.S.W. $\frac{1}{2}$ W. from Ford point.

COWITCHIN HARBOUR is $\frac{1}{2}$ miles westward from cape Keppel, the southern extreme of Admiral island; Separation point (the western point of entrance to Sansum narrows), its northern entrance point, is somewhat remarkable, being the termination of a high, stony ridge. Cowitchin harbour extends westward from this point for 2 miles, and the general depth in it is 30 fathoms, which shoals suddenly as the flat is approached, which dries off for more than half a mile from the head of the harbour.

See chart, No. 2,840.

But for the large tract of good land contained in Cowitchin valley, the port would scarcely be deserving of notice, and it is more of a bay than a harbour. In its north-west end is a considerable river, the Quamitchan, which flows through the fertile valley, and is navigable for small boats or canoes for several miles. There is a settlement here, off which is a long pier (on the south side of the harbour). Coming from the south-eastward the entrance is easily distinguished by the pier and lumber yard, just inside the point on the west side. Mail steamers call here twice a week.

Snug creek.—The only convenient anchorage to be obtained is in Snug creek, on the north side of Cowitchin harbour, or off the outer village on the south side, $1\frac{3}{4}$ miles within the entrance; in the latter case a vessel must approach the shore within little more than one cable, and anchor cautiously, when 12 fathoms are obtained.

Snug creek is a convenient anchorage for small craft or coasters, and one or two vessels of moderate size might obtain anchorage and shelter in it; it extends in a northerly direction for nearly one mile, and is a quarter of a mile in breadth. Nearly in the middle of the entrance is a rock which uncovers at low water in the centre of the kelp; it is about 20 feet in extent, and has $1\frac{1}{2}$ fathoms around it. The western point of entrance can be passed close as it is bold, and has 10 fathoms within half a cable of it; when a quarter of a mile or less, inside the point, anchor in the centre of the creek in 6 fathoms.

A red spar buoy marks the shoal extending from the eastern shore.

SANSUM NARROWS take a general northerly direction between Vancouver and Admiral islands for 6 miles, when they lead into Stuart channel; the average breadth is about half a mile, but at their narrowest part, abreast Bold bluff, they are contracted to one-third of a mile. The high land on both sides renders the wind generally very unsteady; from this cause, as well as from the somewhat confined nature of the channel, and the depth of water which prevents anchoring, the Narrows cannot be recommended except for steamships or coasting-vessels. There are but few dangers to be avoided, and the strength of the tides has seldom been found to exceed 3 knots, generally much less.

Entering Sansum narrows from the southward, Kelp reef, with 9 feet water on it, on the Admiral island shore must be avoided. It

lies 2 cables S.S.W. from a small islet close to the coast, and a quarter of a mile S.W. from Entrance point ; it is marked by a red buoy.

Another rocky patch extends nearly one cable off shore from the eastern side of the Narrows ; it lies one mile N.W. by W. $\frac{1}{2}$ W. from Entrance point.

Burial islet, a small spot used as an Indian burying-place, lies on the eastern side of the Narrows, $1\frac{1}{2}$ miles above Separation point ; pass outside it as close as convenient to the kelp.

Bold bluff, a smooth headland of bare rock, is steep-to ; the channel here is scarcely one-third of a mile across. Rocky ground marked by kelp extends one cable off Kelp point on the western side, almost opposite to Bold bluff ; northward from these points the Narrows increase in breadth to nearly one mile.

Burgoyne bay, the entrance to which is half a mile eastward from Bold bluff, is a narrow and rather deep indentation terminating in a sandy head ; there is no bottom in the bay under 30 fathoms until within 2 cables of its head, when the water shoals suddenly from 10 to 4 fathoms. Anchorage may be had if necessary.

MAPLE BAY.—From Grave point the Narrows take a north-westerly direction one mile to Maple bay. Boulder, the southern entrance point, is remarkable from a large boulder stone standing at its low water extreme. Although an inviting looking bay, the water is too deep for comfortable anchorage, being generally 40 fathoms, and 16 fathoms within one cable of a smooth sandy beach at its western end.*

Bird's-eye cove, which takes a southerly direction for nearly one mile from Boulder point, affords fair anchorage at its entrance in about the centre of the cove, in 13 fathoms, mud bottom, with the boulder bearing N.E. $\frac{1}{2}$ N. ; the cove at this part is not more than one-third of a mile across ; 2 cables southward from this anchorage, shoal water, 2 to 3 fathoms, extends three-quarters of a cable from each side of the cove, which is here only $2\frac{1}{4}$ cables wide ; coasters may go up mid-channel into 4 or 5 fathoms near the head.

Tides.—The rise at springs in Maple bay is 12 feet.

STUART CHANNEL.—Sansum narrows extend $1\frac{1}{2}$ miles northward from Maple bay, when they lead into Stuart channel, the

* See Admiralty plan of Maple bay on chart, No. 714 ; scale, $m = 3$ inches.

westernmost of the ship passages which lie on the eastern side of Vancouver island.*

The western side of Stuart channel is formed by the shores of that island; its eastern, by the coasts of Admiral, Kuper, and Thetis islands; it extends in a general N.W. direction for nearly 20 miles, when it joins Dodd narrows below Nanaimo. The general breadth of the channel is about 2 miles; the depth varies in the southern part from 60 to 100 fathoms, in some parts more, in the northern portion from 20 to 40 fathoms; the principal dangers are North and Escape reefs, White rock, and Danger reef.

On the western or Vancouver island shore there are some good harbours, viz., Osborn bay, Chemainus bay, Oyster harbour, and Kulleet bay; on the eastern side there are also some anchorages, Telegraph and Preedy harbours on the western, and Clam bay on the eastern side of Thetis and Kuper islands.

OSBORN BAY, the southernmost anchorage on the western side of Stuart channel, may be known by Shoal islands, a low wooded group, extending over 3 miles in a W. by N. $\frac{1}{2}$ N. direction, and connected at low water by reefs and mud banks; the south-easternmost of these islands which helps to form the northern side of Osborn bay lies a little over 2 miles N.W. by W. from the north-west entrance point of Sansum narrows. The bay affords good anchorage, sheltered from the prevailing winds, from the westward and S.E.†

Anchorage.—The best anchorage is in 10 fathoms, mud bottom, at half a mile from the southern head of the bay with the south-easternmost Shoal island in line with Southey point, bearing $N \frac{1}{3} W.$; and the southern trend of the coast E. by S. $\frac{1}{2}$ S.

The COAST trends W.N.W. for 4 miles from Osborn bay to Chemainus bay, and is faced by the Shoal islands, and adjacent reefs and mud flats, for nearly the whole distance; and vessels should not approach this shore within half a mile; a rock awash at high water lies nearly half a mile N.N.W. from the south-easternmost Shoal island. The northern point of the North Shoal island has a remarkable flat sandy spit, on which is built an Indian village; there are no passages between the small islands northward of this, and the bank dries off 2 cables at low water.

* See Admiralty chart:—Strait of Georgia, sheet 1, No. 579; scale, $m = 0.5$ inches.

† See Admiralty plan of Osborn bay on chart, No. 714; scale, $m = 3$ inches.

A black spar buoy marks the end of the ledge extending north-westward from the rock, awash at high water, lying off Shoal islands.

CHEMAINUS BAY will be known by a rather remarkable sharp point (Bare point) bare at its extreme, which forms its eastern entrance. The bay extends in a southerly direction for two-thirds of a mile, and is one-third of a mile in breadth, sheltered from all except N.W. winds. There is a timber yard and saw-mill situated on the west side of the bay, from which spars may be obtained for shipping; also stores, post office, and railway station.

Bare Point light is a *fixed white* light, elevated 36 feet above high water, and visible in clear weather from a distance of 11 miles. The light is shown from the roof of the keeper's dwelling, the whole 30 feet high, and painted white.

Bird reef, a rocky ledge uncovering at half tide, extends one cable from the shore, north-westward from the western point of entrance, and lies half a mile W. by S. from Bare point.

Anchorage.—There is convenient anchorage for small vessels off the saw-mill, or within a quarter of a mile of the head of the bay in 8 fathoms; within this distance the water shoals suddenly from 5 to 2 fathoms.

OYSTER HARBOUR is 4 miles W.N.W. from Chemainus bay; the harbour extends in the same direction for 4 miles, is nearly one mile wide at the entrance, narrowing gradually within. Entering from the northward, Coffin islet should be given a berth of 2 cables; at low water the Oyster beds dry 2 cables off the south shore.*

A reef which covers at half flood extends one cable southward from the twin islands; half a mile above this the harbour narrows to a quarter of a mile in width; small vessels may go as far up as the west end of Long island, where 3 fathoms will be found at low water.

A good anchorage for a large vessel is one mile inside the entrance in 9 fathoms, mud bottom, with the south-east end of Long island bearing N.W. by W., and east extreme of Twin islands bearing North; good anchorage may also be had in 6 fathoms, mud bottom, nearly three-quarters of a mile further up the harbour.

Tides.—It is high water at full and change in Oyster harbour at 6h. 0m. p.m.; springs rise 10 feet.

* See Admiralty plan of Oyster harbour on chart, No. 714; scale, $m = 3$ inches.

KULLEET BAY is $2\frac{1}{2}$ miles northward from the entrance of Oyster harbour, and the same distance W. by S. from Reef point, the north-west point of Thetis island.

Anchorage may be had in 8 fathoms at half a mile from its head on a bank which projects from the southern shore, with Deer point, at the northern entrance of the bay bearing N.E., and the southern trend of the coast bearing S.E. by E.; but it is open and cannot be recommended, unless in fine weather, or with off-shore winds.

Yellow point, bare and grassy at its extreme, is the north point of Kulleet bay; a rock, nearly awash at low water springs, with a depth of 10 fathoms half a cable eastward of it, lies about 2 cables eastward of Yellow point, in a position with White rock centre bearing E. by N. $\frac{1}{2}$ N., distant $13\frac{8}{10}$ cables.

The COAST, from Yellow point to Round island, at the southern entrance of Dodd narrows, trends N.W. $\frac{1}{2}$ W. for 5 miles. When working for the narrows, White rock and Danger reef must be avoided. At $1\frac{1}{2}$ miles southward from Round island is Boat harbour, at the entrance of which a vessel may drop an anchor in 8 to 10 fathoms if waiting for the tide, though there is equally good anchorage nearer to the narrows.

North reef is a sandstone ledge extending in a north-westerly and south-easterly direction, as all the reefs in this channel do. It lies half a mile S. by E. $\frac{1}{2}$ E. from the south-east point of Tent island. It is just awash at high water, and therefore easily avoided; its shoal part extends for one-third of a mile, in a W.N.W. direction, steep on its north and south sides.

TENT ISLAND, narrow and two-thirds of a mile long, lies off the south extreme of Kuper island. One cable off its south-east end are two remarkable worn sandstone rocks 8 or 10 feet above water, with a passage one-third of a mile wide between them and North reef.

At nearly 2 cables N.E. $\frac{1}{2}$ E. from the south-east end of Tent island is a rock which uncovers 2 feet, and has shoal water, 2 to 3 fathoms extending 2 cables around it. When passing eastward of Tent island, its eastern shore should be given a berth of half a mile, as some ledges extend off it. There is no ship passage between Tent and Kuper islands, there being a depth of only one fathom at low water.

Escape reef, 2 miles N.W. by W. from North reef, is a dangerous patch, nearly one-third of a mile in extent, in a W.N.W. and E.S.E. direction, which covers at a quarter flood, and has no kelp to mark its position. It lies nearly half a mile from the west shore of Kuper island, $1\frac{1}{4}$ miles, W. $\frac{1}{2}$ S. from Jesling (its south) point, and a little more than half a mile South from Upright cliff, Kuper island; there is a deep channel one-third of a mile wide between it and Kuper island.

Yellow point just open westward of Scott island, off Preedy harbour, bearing N.W. $\frac{1}{4}$ W. leads 3 cables westward of the reef. Sandstone rocks off the south-east point of Tent island kept open of that point also lead westward of it.

Alarm rock is scarcely in the track of vessels working up Stuart channel. It lies one cable S. by W. from the south-east point of Hudson island, approach to Telegraph harbour. It just covers at high water, and is connected by a ledge with Hudson island.

False reef lies $3\frac{1}{2}$ cables W. by N. $\frac{1}{2}$ N. from Scott island, and a long half mile S.W. $\frac{1}{2}$ S., from Crescent point, the north-west point of Preedy harbour; it is awash at low water.

White rock, about 30 yards long, and 15 feet above high water, lies one mile N.N.W. from Reef point, the north-west extreme of Thetis island; a bank having from 2 to 5 fathoms on it extends 2 cables north-westward from the rock. This rock has a whitish appearance, and is readily distinguished from a vessel's deck at a distance of 2 or 3 miles. It should not be passed within 2 cables distant, and there is a good passage between it and Thetis island, giving Reef point a berth of half a mile to avoid a rocky ledge extending nearly that distance north-westward from it.

Ragged island, a low rocky islet, with a few trees on it, lies one-third of a mile W.N.W., from Pilkey point, the north end of Thetis island.

Danger reef, lying one mile N.W. $\frac{1}{2}$ N. from White rock, and $1\frac{1}{2}$ miles, N.E. by N. from Yellow point, covers a space of half a mile almost in the centre of the channel. A small portion of it is generally awash at high water, at which time it is difficult to make out until within a short distance of it.

Directions.—When passing through Stuart channel, there is a clear passage one mile in breadth between Danger reef and the Vancouver island shore, and going either up or down the channel, White rock is kept in line with the north-east extreme of Thetis island, bearing E.S.E., which leads 3 cables westward of the reef.

Bound southward through Stuart channel from Dodd narrows, pass at from one to 2 cables eastward of Round island, and steer for the westernmost ragged tree summit of Thetis island, S.E. $\frac{3}{4}$ E., this course leads in mid-channel, and over half a mile westward from Danger reef, and White rock; when the latter bears East, alter course to S.S.E. for Stuart channel.

There is a clear passage three-quarters of a mile wide between White rock and Danger reef, and half a mile between the reef and Tree island, with a depth of over 30 fathoms. As White rock and Tree island are always visible, and Danger reef is generally above water, there can be no difficulty in either of these passages to vessels coming up Trincomali channel.

Vesuvius bay, on the western side of Admiral island, immediately opposite Osborn bay, has deep water, but shoals suddenly at its head; if necessary, anchor in 9 fathoms at $1\frac{1}{2}$ cables from the shore; but it is not recommended.

There is also anchorage for coasters inside Idol islet in Houston passage. This islet lies $1\frac{1}{4}$ miles E. by N. from the south end of Tent island, and is $2\frac{1}{2}$ cables from Admiral island; with the islet bearing W. by N., and midway between it and the shore, there is anchorage in 6 fathoms.

Grappler reef, on the eastern side of Houston passage, is one cable in extent and uncovers at very low water. It lies a quarter of a mile off the north-west end of Admiral island, and there are 5 fathoms between it and the shore of the island. Passing through Houston passage, the eastern point of Sansum narrows kept well open of the points of Admiral island to the northward of it, the latter bearing S.E. $\frac{1}{2}$ S., leads 2 cables westward of the reef, and when the southern point of Secretary island is open of Southey point bearing N.E. by N., it is cleared to the northward.

A spar buoy, in 7 fathoms, lies on the south-west extreme of the reef.

TELEGRAPH HARBOUR, on the west side of Kuper island, is a snug anchorage, and its entrance is between Hudson island and Active point; which are half a mile apart. Entering from the southward, Escape reef (page 121) must be avoided. If passing inside the reef, the shore of the island should be kept aboard within a quarter of a mile; if outside or westward of it, then keep Yellow point (north point of Kulleet bay) just open westward of Scott island, off Preedy harbour, bearing N.W. $\frac{1}{2}$ W., until Upright cliff of Kuper island bears N.E., when a vessel will be northward of it, and may steer for the entrance of the harbour.*

Anchorage.—There is good anchorage in 8 fathoms, with the north-west end of Hudson island bearing W.S.W., and Active point S.E. $\frac{1}{2}$ S.; or 2 cables further in, in 8 fathoms. Above this, the harbour contracts to a narrow creek extending one mile N.W., where coasters may find anchorage in 2 to 3 fathoms; the continuation of this creek easterly separates Kuper from Thetis island, which at low water are connected. The wharf on the eastern shore has a depth of 9 feet alongside the end.

Tides.—It is high water, full and change, in Telegraph harbour at 6h. 0m.; springs rise 10 feet.

Preedy harbour is separated from that just described by a group of small islands and reefs; its entrance is northward of them between Scott island and Crescent point of Thetis island, and is one-third of a mile wide. When entering, the Thetis island shore should be kept well aboard to avoid False reef.

Shoal water extends for $1\frac{1}{2}$ cables off the northern sides of Scott and Dayman islands.

Anchorage will be found in 7 fathoms, with Crescent point bearing W.N.W., distant nearly half a mile, and east point of Dayman island bearing S. by W.

SWANSON CHANNEL leads from Haro strait north-westward between Admiral island on the west and Pender island on the east; passing eastward of Prevost island it enters Active pass between Galiano and Mayne islands, and thence into Georgia strait; northward of Active pass it connects with Trincomali channel.

ADMIRAL ISLAND, separating Stuart from Trincomali and Swanson channels, is of considerable extent, being nearly 15 miles in length N.W. and S.E., and varying in breadth from 2 miles at its

* See Admiralty plan of Telegraph harbour on chart, No. 714; scale, $m = 3$ inches.

northern end to 6 at its southern. It has two good ports, Fulford harbour on its south-east, and Ganges harbour on its eastern side. The southern portion of the island is a peninsula formed by the indentations of Fulford harbour and Burgoyne bay (a valley separating the heads of these ports), composed of a lofty ridge of mountains over 2,000 feet in height, rising abruptly from all sides; the summit, mount Bruce, being 2,329 feet high.

Immediately northward of the valley, and over Burgoyne bay on its western side, mount Baynes rises to an elevation of 1,953 feet, and is very remarkable, its southern face being a perpendicular precipice visible a long distance from the southward or eastward. The Otter range of somewhat less elevation rises northward of mount Baynes, from whence the island slopes away in a wedge shape, its northern termination, Southey point, being a sharpe extreme. The island is for the most part thickly wooded, but there is a considerable extent of partially clear land both in the valley at the head of Fulford harbour and at the northern end of the island, which has become peopled by settlers under the name of Salt Spring district, from the fact of several salt springs having been discovered.

FULFORD HARBOUR penetrates the south-east side of Admiral island in a W.N.W. direction for $2\frac{1}{2}$ miles. At its entrance is Russell island, between which and Isabella point, the western point of the harbour, is the best passage in. Immediately over the north side of the harbour is Reginald hill, a stony elevation between 700 and 800 feet high.

Cecil rock with 2 fathoms water on it lies one-third of a mile S.E. by E. $\frac{3}{4}$ E. from the south-west point of Russell island.

The southern entrance is two-thirds of a mile wide with a depth of 20 fathoms until abreast North rock; here the harbour narrows, and has a general breadth almost to its head of a little less than half a mile; the depths decreasing to 13 and 10 fathoms, and at $3\frac{1}{2}$ cables from the head to 5 fathoms, when the water shoals rapidly on the edge of the bank which extends about 3 cables from the shore at the head of the harbour.

North rock is a small rocky islet lying close off the north point of the harbour; a rock, which covers at a quarter flood, lies 2 cables West from it, and more than $1\frac{1}{2}$ cables from the shore, so that strangers entering should keep to the southward of mid-channel until past it.

The northern passage into the harbour between Russell island and Eleanor point, though in places not more than a quarter of a mile wide, is a safe channel of from 14 to 18 fathoms water.

Louisa rock, with one fathom on it, is the only known danger; it lies 2 cables from the northern or Admiral island shore, with the west end of Russell island bearing S.E. $\frac{1}{2}$ S., distant 4 cables, and North rock W.S.W. the same distance; with a leading wind the Russell island shore should be kept rather aboard.

Anchorage.—There is good anchorage in 10 fathoms in the centre of the harbour with Reginald hill bearing E.N.E.; at the head of the harbour is a considerable fresh-water stream, from which shoal water extends for 3 cables.

GANGES HARBOUR is a safe and commodious port for vessels of any description or size, and has two entrances. Its southern entrance, in Swanson channel, lies between Admiral and Prevost islands; the northern entrance is by Captain passage. When entering from the southward, Channel islets may be passed on either side, but by far the widest passage is to the northward of them; they are two small wooded islets, $1\frac{1}{2}$ miles within Beaver point, and 2 cables from the shore of Admiral island.

The fair channel into the harbour, between Channel and Acland islands, is nearly half a mile wide, the depth being 30 fathoms; having passed these islands the harbour is nearly $1\frac{1}{2}$ miles wide, and the general depth for 2 miles, is from 20 to 13 fathoms.

There are few dangers in the harbour, and they are easily avoided. A rocky patch with one fathom on it lies $2\frac{3}{4}$ cables W. $\frac{1}{4}$ N. from the west point of the westernmost Acland island, and the same distance off shore. There is another one-fathom patch which is more in the track of vessels; it lies nearly 2 miles W. by N. $\frac{1}{2}$ N. from the southernmost Channel islet.

Liddell point, the south-east extreme of Prevost island, and the northern entrance point of the harbour, has a reef which is covered at half flood extending 2 cables eastward from it.

The Acland islands, two in number, lie to the westward of Liddell point along the shore of Prevost island, between which and them there is no ship channel.

Chain islands are a group of 6 or 7 low narrow islets connected by reefs, extending from the head of the harbour in an E.S.E. direction for $1\frac{1}{2}$ miles. Southward of these islands the ground is clear; but northward of them are scattered reefs, and it is not recommended to anchor on that side above the outermost island.

Anchorage.—Anchor as soon as a depth of 10 or 12 fathoms is found; a good berth is in 11 fathoms with Peile point, and the two entrance points of Long harbour nearly in line bearing N.E. by N., and the easternmost Chain island W.N.W. If desirable, anchorage may be had in 6 fathoms mud, midway between the Chain islands and the south shore, the easternmost island bearing E.N.E., or in a still snugger berth one mile above, off the sandy spit on Admiral island, in 4 or 5 fathoms. This latter berth is recommended for vessels of moderate size intending to make any stay.

CAPTAIN PASSAGE also leads into Ganges harbour, northward of Prevost island. It is a clear deep passage, one-third of a mile wide, with depths of from 30 to 40 fathoms; and those from the northward intending to enter the harbour should always use it. There is only one known danger, which is well inside Ganges harbour, and which is almost equally in the track of vessels working up by the southern passage; it is a small patch of 2 fathoms lying $3\frac{1}{2}$ cables S.W. by W. from the western entrance point of Long harbour. Entering by Captain passage, Peile point should not be shut in by the entrance points of Long harbour until the opening between Prevost and Acland islands is shut in, when this reef will be well cleared. When working up the southern channel, do not stand so far eastward when in the neighbourhood of this patch, as to open the passage between Acland and Prevost islands.

LONG HARBOUR may be almost considered as part of Ganges harbour. It is a long, narrow creek, its general breadth being 2 to 3 cables, and it lies to the eastward of Ganges harbour and runs parallel to it for $2\frac{1}{2}$ miles. Its entrance is between two sloping, rocky points, similar to each other, on the west side of Captain passage. At a quarter of a mile inside the entrance is a high, bare islet, which must be passed on its south side; and at one mile inside the entrance there is also another and somewhat similar island, which may be passed on either side. Outside these islets the depth is from 14 to 16 fathoms; above them, 4 and 5 fathoms. At the head of the

creek is a snug place for a ship to repair, &c., but as a harbour, it is only adapted to steam-vessels or coasters, and, with the good and easy anchorage of Ganges harbour so close, there would appear to be no reason to recommend this contracted and inconvenient one.

PREVOST ISLAND, lying in the centre of Swanson channel, is moderately high, thickly wooded, and of an irregular shape. It is 3 miles long, in a N.W. and S.E. direction, $1\frac{1}{4}$ miles in breadth, and on its southern and western sides it is indented by several bays and creeks; its northern side is almost a straight cliffy shore.

LIGHT.—Portlock point light is a *fixed white* light, with a *red* sector showing over Enterprise reef, elevated 72 feet above high water, and visible from a distance of 10 miles in clear weather.

The lighthouse, 49 feet high, is a square, pyramidal, wooden tower, with room attached, painted white, lantern red.

Fog signal.—From a small wooden tower $1\frac{1}{2}$ cables S.E. of the lighthouse a bell is struck once every fifteen seconds.

Ellen bay, on the south-east side of Prevost island, between Liddell and Red islet points, is three-quarters of a mile deep, by one-third in breadth, narrowing to 2 cables, one-third of a mile from its head, and affords fair anchorage with all but south-easterly winds in 10 fathoms, mud bottom. The head of this bay is a grassy, swampy flat, only one cable wide, separating the bay from the creeks on the western shore. There are two bays northward of Ellen bay, but too small to afford any shelter.

Annette and Glenthorne creeks, on the western or Ganges harbour side, are curious, narrow indentations extending into the island for one mile in an E. by S. direction, and only separated from each other by a narrow stony ridge. In Glenthorne, the western one, there are 3 fathoms water, the other has $1\frac{1}{2}$ fathoms; they are snug places for small craft, or to repair a vessel.

James bay, on the north-west side of the island, and on east side of Captain passage, affords fair, but very confined anchorage in 10 fathoms for a vessel of moderate size, sheltered from southerly winds, but she must get well in, as there are 18 to 20 fathoms water in the outer part of the bay.

Hawkins island, a small, rocky islet with a few bushes on it, lies close off a remarkable white shell-beach, on the north-east side of Prevost island.

Charles rocks.—From 2 to $3\frac{1}{2}$ cables W. $\frac{1}{2}$ N. from the north-western point of Hawkins island are the Charles rocks, three smooth-topped rocks, not marked by kelp, and uncovering towards low water.

ACTIVE PASS.—From Discovery island at the southern entrance of Haro strait, to the sand heads of Fraser river, by the Active pass, is just 40 miles, and the line is almost a straight one. By adopting this route, not only the most dangerous and inconvenient part of the Haro strait is avoided, viz., its northern entrance abreast the East point of Saturna island and Patos island (where the tides are strong and apt to set a vessel down Rosario strait, or over on the eastern shore), but a distance of nearly 10 miles is saved.

From Portlock point, the south-eastern bluff of Prevost island, the entrance of Active pass bears N. by W. $\frac{1}{2}$ W. distant $1\frac{1}{4}$ miles. The southern entrance point of the pass, Helen point, is low, bare, and of a yellowish colour; over its northern side rise the high, stony hills, on the southern side of Galiano island; the entrance itself does not become very apparent until it is approached within one mile.

Active pass takes an E.N.E. direction for $1\frac{1}{2}$ miles, and then turns North for the same distance, fairly into Georgia strait. The average breadth of the channel is about one-third of a mile, and its general depth about 20 fathoms; a small rock lies off Laura point, on which there is said to be a depth of only a few feet, and which should, therefore, not be closely approached; and at a quarter of a mile within the southern entrance, and very close off the northern shore, lies a rock which uncovers at half tide.

The edge of the reef off Gossip island, at the northern entrance to the pass, is marked by a black can buoy.

Caution.—The great strength of the tides, together with the absence of steady winds, renders it unfit for sailing-vessels, unless, indeed, small coasters; for steam-vessels of moderate size commanding a speed of not less than 8 knots it is an useful pass; but it is advisable for large ships and those deeply laden to pass through at, or near slack water. Strong contrary under currents and cross currents have been experienced.

LIGHT.—From a square, white, wooden, light tower, situated on Georgina point, is exhibited at an elevation of 55 feet above high water, a *flashed white* light, visible between the bearings N. 39° E., through south, and S. 84° W., and should be seen in clear weather 12 miles.

Fog signal.—A steam horn gives a blast of *eight seconds* duration *every minute*.

Position.—The lighthouse is situated in latitude 48° 52' 40" N., longitude 123° 17' 50" W.

Otter bay.—If overtaken by night, or waiting for tide, Otter bay, on the west side of Pender island, is a good stopping-place; it is one mile North from Mouatt point; fair anchorage is to be had in the centre of the bay, in 8 fathoms.

Miners bay, on the south side of Active pass, where it takes the sharp turn to the northward, affords anchorage, if necessary; but a vessel must go close in to get 12 fathoms, and then is barely out of the whirl of the tide.

Directions.—After entering Swanson channel between Admiral and Pender islands steer to pass to the eastward of Prevost island, and keep Pelorus point (the eastern extreme of Moresby island) open of Mouatt point (the western extreme of Pender island) bearing S.E. $\frac{1}{2}$ S., which will lead over one-third of a mile westward of Enterprise reef, and when Helen point bears N. by E., the reef will be cleared, and the entrance of the pass may be steered for.

If coming out of Navy channel, between Pender and Mayne islands, keep over for Prevost island until Pelorus point is open of Mouatt point; these two points in line, or just touching, lead very close on Enterprise reef.

When passing through Active pass to the westward against the flood, keep rather on the southern shore of the pass, as the stream sets over towards a rock, which uncovers at half tide, and lies very close to the northern shore, about a quarter of a mile within the southern entrance.

When entering or passing out of the northern entrance of Active pass, the point of Gossip island, on the west, and also Georgina point (north extreme of Mayne island) on the east, should be given a good

berth; indeed, the best directions which can be given are to pass through in mid-channel.

Tides and tidal streams.—The flood stream in Active pass sets from west to east, or from the Swanson channel into Georgia strait; and the ebb, in the contrary direction.

The ebb stream is locally reported to commence shortly after high water and to run until about three-quarters of an hour after the tide has begun to rise on the shore.

The velocity during springs is sometimes 7 knots; at ordinary tides, from 3 to 5. In the northern entrance there is sometimes a heavy tide ripple, caused by a patch of 7 fathoms, and by the meeting of the tide through the pass with that in the strait; as before mentioned, it is recommended to pass through in mid-channel; no favourable eddy, or less strength of tide, will be found on either side, unless inside the kelp which lines the shores.

It is high water, full and change, at 4h. 0m.

TRINCOMALI CHANNEL.—Like all the Inner channels already described, this one must be classed as essentially a channel for steam-vessels or coasters; it can only be used with advantage by those bound to the eastern ports of Vancouver island southward of Nanaimo, or by such as choose to enter Nanaimo itself by the contracted pass, Dodd narrows.

The eastern side of the channel is formed by the long narrow islands Galiano and Valdes, and the western by Admiral, Kuper, and Thetis islands, and part of the eastern shore of Vancouver island. Montague harbour on the western side of Galiano island is a good stopping place, also Clam bay on the east side of Thetis island.

Trincomali channel contracts when abreast Narrow island to less than one mile in width, but the shores are bold on both sides. On the shore of Galiano island, one mile N.E. from the south-east point of Narrow island, is Retreat cove, offering shelter for boats or anchorage for coasters; an island lies in the centre of it.

Portier and Gabriola passes, leading into Georgia strait, are both intricate and dangerous, unless to those perfectly acquainted with them, and the tides are so strong, and varying in their set, that they cannot be said to be applicable to the general purposes of navigation, and few navigators would be justified in using them unless in cases of emergency. (*See* pages 133, 136).

Montague harbour is between the south-east side of Galiano island and Parker island, and its entrance, between Phillimore point and Julia island, is $1\frac{1}{2}$ miles W.N.W. from the west entrance of Active pass. The entrance is about one cable wide, but has deep water. This harbour, though small, is a snug and secure anchorage, with a general depth of 6 fathoms, good holding ground; several Indian lodges are built on the shores of the bay. There is a narrow passage north-westward from this harbour into the Trincomali channel, the least depth in which is 3 fathoms.

Several small islands extend W.N.W. from Parker island, namely, Sphinx, Charles, Wise, and Twin islands, the latter are two rather remarkable rocky islets about 30 feet high; between this group and Galiano island is a passage half a mile wide with good anchorage in 10 fathoms.

A rock which uncovers at low water springs is reported to lie 2 cables W. by N. $\frac{1}{2}$ N., from Twin islands.

Atkins reef lies on the western side of Trincomali channel, one-third of a mile from the shore of Admiral island, and in the track of the vessels working up or down. It is one cable in extent, and covers at 4 feet rise of tide, its neighbourhood being marked by kelp, which, however, is rarely seen when there is any ripple on the water. The reef lies $1\frac{1}{2}$ miles S. $\frac{1}{2}$ E. from Twin islands; and one mile E. by S. from the south-east end of the peninsula which forms Walker hook. There is a passage of 16 fathoms between the reef and Admiral island, and it may be passed one cable distant on the outside.

Walker hook is formed by a peninsula 4 miles W. by N. $\frac{3}{4}$ N. from Captain passage. On its south-east side is fair anchorage for small vessels in 6 fathoms, but a shoal patch marked by kelp, one-third of a mile in extent, lies from 2 cables to over half a mile E.N.E. from the south-east point of the peninsula; small vessels may pass between this shoal and the point in 5 fathoms, or between it and Atkins reef, which is better, and anchor in 6 fathoms, 2 cables southward from the neck of the peninsula. There is also anchorage in 10 fathoms northward of the peninsula, but do not go within the north point of the hook as it dries a long way out.

Governor rock, a dangerous rocky patch lying almost in the centre of Trincomali channel, has 4 feet on it, is about half a cable

See chart, No. 579.

in extent, and though kelp grows on it, yet it is very difficult to make out until quite close to. It lies $1\frac{3}{4}$ miles W. $\frac{3}{4}$ S. from Twin islands, and $1\frac{1}{4}$ miles S.S.W. from Quadra hill. This hill cannot be mistaken; it rises from the centre of Galiano island 750 feet, and a remarkable white basaltic cliff will be seen on the coast immediately southward of it. A conical black buoy is moored on the eastern side of this rock.

Walker rock lies two-thirds of a mile North from Governor rock, and covers at 4 feet rise. It lies $1\frac{3}{4}$ miles W. by N. $\frac{1}{2}$ N. from Twin islands, and $1\frac{1}{4}$ miles S.W. by S. from Quadra hill.

A beacon of stone, 8 feet high, surmounted by a staff 18 feet high, with cross pieces at right angles, painted black on east and west sides and white on north and south, stands on Walker rock.

Directions.—Take the passage southward of Governor rock, or that between it and Walker rock, or northward of the latter. If taking the southern passage, after clearing Atkins reef, and the shoal off Walker hook; the coast of Admiral island should be kept aboard within half a mile, until Quadra hill bears N.E., when steer N.N.W. over towards Galiano island, giving the south-east end of Narrow island a berth of at least half a mile, as a reef extends off it.

The marks for a mid-channel course are, the north-east point of Thetis island kept well open of the eastern side of Narrow island, the latter bearing W. by N. $\frac{1}{2}$ N.; steer up with these marks on until Quadra hill bears N.E., taking care not to open the north-east point of Thetis island so much of Narrow island as to bring the former in line with Hall island, as this would lead on to Walker rock. The north-east point of Thetis island should be kept just halfway between the east side of Narrow, and west side of Hall islands; these marks are very clear and well defined, and are generally seen from a long distance.

Houston passage, between Kuper island and the western end of Admiral island, leads from Trincomali into Stuart channel. Those intending to take it had better pass up southward of Governor rock. The entrance is between the north-east point of Admiral island and Narrow and Secretary islands; the southern side of Narrow island is foul, several small islets and rocks extend from one to 3 cables off it; at $1\frac{1}{4}$ miles E. by S. from Southey point, a bank having from 2 to 3 fathoms extends one-third of a mile off the

shore of Admiral island, narrowing the navigable channel between that island and Narrow island to one-third of a mile.

Portier pass, into Georgia strait, though short (not exceeding one mile from its southern entrance until fairly in the strait), is narrow, and is rendered still more so by sunken rocks; the tidal streams run from 4 to 7 knots, and overfalls and whirling eddies are always in the northern entrance.

Caution.—In consequence of the numerous dangers existing in Portier pass. Mariners are advised to avoid that passage.

Tides and tidal streams.—The flood stream sets from Trincomali channel northward into Georgia strait, and the ebb in the contrary direction. The ebb stream commences from one to $1\frac{1}{2}$ hours before high water by the shore, and runs for one hour after low water, or from 7 to 8 hours.

It is high water, full and change, at about 4 p.m., but it is not very regular. At springs the streams run 4 to 7 knots with dangerous whirls and eddies.

CLAM BAY, on the eastern side of Thetis and Kuper islands, opposite Portier pass, is formed by the shores of these two islands approaching each other; and the continuation of the bay separates these two islands at high water, when there is a boat channel into Telegraph harbour (page 123) on their western side.*

White spit is a remarkable point of broken clam shells, which can be seen from a long distance, and forms the southern entrance point of the bay; immediately southward of it is a considerable native lodge; a reef, having less than one fathom on it in some places, extends over 3 cables in an E.S.E. direction from White spit point; Leech island off the northern point of the bay is a small wooded islet.

Centre reef, with 6 feet on it, and marked by kelp, should not be approached nearer than $1\frac{1}{2}$ cables, it lies almost in the centre of the entrance, nearly 3 cables N.W. $\frac{1}{2}$ W. from White spit, and one-third of a mile E. by S. from Leech island.

Rocket shoal, on which there is a depth of 6 feet, lies nearly in the centre of the bay, with White spit extreme in line with the highest part of Indian island, bearing E. $\frac{1}{4}$ S., it is half a cable in extent, with depths of from 2 to 4 fathoms around it.

* See Admiralty plan of Clam bay, on chart No. 714; scale, $m = 3$ inches.

Directions.—The best passage into Clam bay from the eastward, is northward of Narrow, Secretary, and Indian islands, between them and Hall island; after passing Indian island steer in for White spit on a S.W. bearing, giving it a berth of one cable.

Anchorage may be had in Clam bay in 6 fathoms between Rocket shoal and the shore.

Rose islets, five small rocky islets, the northernmost about 20 feet high with a few bushes on it, lies half a mile westward from the north end of Reid island, but with no ship passage between. When bound to Clam bay from the northward, pass westward of these islets.

Yellow Cliff anchorage.—There is fair anchorage on the western side of Valdes island, 2 miles above Portier pass, immediately off a yellow cliff; 8 fathoms, sandy bottom, will be found with the cliff bearing N.W. by N. distant a quarter of a mile.

It will also be known by Shingle point, a low projection with a native village on its extreme, one-third of a mile W. by N. from the yellow cliff.

DODD NARROWS.—To steam-vessels of moderate length, that answer the helm quickly, this narrow pass offers no danger. The strength of the tidal stream at its greatest rush is over 8 knots, the least depth of water, 7 fathoms, and the narrowest part of the channel is 80 yards wide.

If bound through Dodd narrows from the southward, and having to wait for slack tide, there is fair anchorage with but little stream, westward of Round island in 6 fathoms, midway between it and the shore.

Percy anchorage on the north side of the Narrows, between Gabriola and Mudge islands, is a convenient place to wait for the tide.

Directions.—When proceeding for Dodd narrows from abreast Portier pass, the most direct course is northward of Danger reef, between it and Tree island; the latter is a small round wooded islet lying off the south end of De Courcy islands; this passage is two-thirds of a mile wide, with depths of from 25 to 30 fathoms.

Danger reef (page 121) should not be approached within one-third of a mile; if the reef should not be seen it is recommended to pass a quarter of a mile southward of Tree island.

The passage between White rock and Danger reef is good, it is half a mile wide, with depths of from 20 to 30 fathoms. White rock is 15 feet high, and may be passed if necessary on either side, distant $2\frac{1}{2}$ cables.

When going northward, keep on the eastern side of Round island ; after this keep in mid-channel, and attend the steerage quickly and carefully. When through the Narrows the strength of the tide ceases, and a vessel will be in Northumberland channel, a fine wide passage leading to, and only 5 miles from, the anchorage at Nanaimo. Dodd narrows are not so easy to pass through from the north as from the south, as in the former case the slight bend that has to be made must be made immediately on entering the narrow part.

False narrows.--When taking the Narrows from the northward, be careful not to mistake False narrows, on the northern side of Northumberland channel ; they are much wider than the real pass, but nearly dry at low water.

The channel in False narrows is marked by 3 single pile beacons, one *spar* buoy, painted red, and two *spar* buoys, painted black.

This channel is dangerous and intricate, and should not be attempted by anyone not thoroughly acquainted with the locality. The depth in the channel marked is about 3 fathoms at high water.

The tides should be studied in passing either way. Do not attempt it with the full rush of the stream ; an hour before or after low water there is no difficulty to a steam-vessel.

Tides and tidal streams.--It is high water in Dodd narrows at full and change at 3h. 30m. p.m., and low water at 9h. 30m. a.m., and at that period the flood stream commences at low water and runs about 7 hours. The first of the flood is the best time to pass the Narrows. When leaving Nanaimo and intending to pass down, be at the Narrows an hour before high or low water, as the tides are nearly an hour earlier there. The ebb stream sets across the northern entrance to the Narrows

PYLADES CHANNEL.--The De Courcy islands extend $4\frac{1}{2}$ miles E.S.E. from Mudge island, which separates the False from Dodd narrows, and on the northern side of the group, between them and Valdes island, is Pylades channel, which leads by Gabriola pass into Georgia strait, as well as to the entrance of the False narrows.

The channel has an average breadth of one mile, with a depth of 35 fathoms, and at its head, near the entrance to the False narrows, is good anchorage in 9 fathoms, convenient for those waiting for the tide.

Ruxton passage between the north and middle De Courcy islands is half a mile wide.

Gabriola pass, between the south end of Gabriola island and the north end of Valdes island, is not recommended, for it is a narrow and intricate channel, something of the same character as Dodd narrows, except that it is a much longer reach; its narrowest part is not over 250 yards in breadth, and the shoalest water is 6 fathoms.

Overhead telegraph wires are stretched across Gabriola pass; those having masts over 30 feet high, should not attempt to pass under the wires.

The shore end of the telegraph cable laid from Grey point (connecting Vancouver island with the mainland) is landed at Valdes island, $2\frac{1}{2}$ miles south-east of Gabriola pass. Wires are thence carried to Nanaimo and Victoria.

Tidal streams.—The tidal streams in Gabriola pass run from 5 to 6 knots.

See chart, No. 579.

CHAPTER IV.

MIDDLE CHANNEL.—LOPEZ SOUND.—ORCAS WEST
AND EAST SOUNDS.

Variation from $22\frac{1}{2}^{\circ}$ to 23° East in 1898.

MIDDLE CHANNEL is the centre of three passages leading from Juan de Fuca strait into that of Georgia, and is bounded by San Juan island on the west, and the islands Lopez, Shaw, and Orcas on the east. Although adapted for steamships of the largest size, the southern entrance is confined, and subject to strong tidal streams, with a general absence of steady winds; the wide straits, Rosario and Haro, on either side of it, are to be preferred for sailing-vessels.*

When entering, the danger to be avoided on the western side is the Salmon bank, and on the eastern, Whale rocks, always out of water. The tidal streams in this entrance set from 3 to 7 knots an hour, with eddies and rippings; when within the entrance, there is far less stream, and Griffin bay, offering good anchorage, is easily reached.

LIGHT.—On Cattle point a *fixed white* light is exhibited at an elevation of 100 feet above water.

Salmon bank extends $1\frac{1}{2}$ miles South from Cattle point, the south-east extreme of San Juan island, a bare point about 50 feet high, sloping from mount Finlayson, and the least depth found on it is 10 feet, with rocky patches, marked in summer by kelp; depths varying from 4 to 9 fathoms extend a further distance of three-quarters of a mile in the same direction.

A black can buoy marks the southern edge of the bank.

Whale rocks, on the eastern side of the entrance, are two black rocks one cable apart, and 3 or 4 feet above high water; a patch with one fathom on it, on which kelp grows, extends 2 cables S.S.E.

* See Admiralty charts:—Haro strait and Middle channel, No. 2,840; scale, $m=1\cdot0$ inch; also Haro and Rosario straits, No. 2,689; scale, $m=0\cdot5$ inches.

from them, otherwise they are steep-to, but it is not recommended to pass them nearer than a quarter of a mile, as the tidal streams set strongly over them.

Directions.—Entering Middle channel, Cattle point should be given a berth of at least $1\frac{3}{4}$ miles. Mount Erie, a remarkable mountain on Fidalgo island 1,250 feet high, in line with Jennis point bearing N.E. by E. $\frac{1}{4}$ E. leads $1\frac{1}{4}$ miles South of Salmon bank; when the entrance to the channel is open, bearing N.N.W., or when Goose island, a small islet on the western side of the entrance, is in line with Orcas Nob bearing N.N.W. $\frac{1}{2}$ W., steer in for the passage. Orcas Nob is a remarkable conical hill, with a bare stony summit, 1,104 feet above the sea, rising over the west side of Orcas island.

The bottom in the channel is rocky and irregular, varying in depth from 18 to 60 fathoms, causing overfalls and eddies which are apt to turn a ship off her course unless the helm be given quickly to meet them.

Griffin bay is immediately within the southern entrance of Middle channel. Although spacious, yet from the great depth of water there is but a limited portion of the bay available for anchorage, and this is in the southern angle, immediately off the remarkable prairie land between two forests of pine trees.*

With all westerly or southerly winds Griffin bay affords good shelter; but with those from North or N.E. it is considerably exposed, and landing is difficult in consequence of the long flat which extends off the beach. These winds, however, are not of frequent occurrence.

Half-tide rock, just awash at high water, lies 4 cables from the western shore of the bay. There is another rock which covers at a quarter flood, lying one-third of a mile N. $\frac{1}{2}$ W. from the pier on the beach.

The best anchorage is in 9 fathoms, mud bottom, with the southernmost of the white cliffs on Lopez island well open of Harbour rock, bearing E. by N. $\frac{1}{2}$ N.; from this position the water shoals rapidly towards the shore, and at $1\frac{1}{2}$ cables nearer in, there are only 3 fathoms; a stranger should drop an anchor directly 12 fathoms is obtained.

North bay, in the north-west angle of Griffin bay, immediately under Park hill (a bare grassy eminence about 180 feet high), affords

* See Admiralty chart :—Griffin bay, No. 611; scale, $m = 3.0$ inch.

good anchorage in from 4 to 10 fathoms, mud bottom, with all winds but those from S.E., to which it is somewhat exposed. The bottom here is more regular than in Griffin bay, and altogether it is perhaps a snugger anchorage.

Anchor in from 6 to 9 fathoms, mud bottom, with the east point of Dinner island bearing S.S.E. $\frac{1}{2}$ E., distant 4 cables.

New shoal, in the fairway of the entrance to North bay, has 3 feet over it and is marked by kelp a quarter of a mile in extent. A spar buoy, coloured in horizontal stripes, is moored with north extreme of Dinner island W. by S. distant 6 cables. Those without local knowledge are recommended to pass southward of the shoal.

Tides and tidal streams.—The range at the southern entrance of Middle channel, at full and change, is 12 feet; but little stream is felt at the anchorages. With the flood an eddy, of about one knot an hour, sets southward in Griffin bay, and with the ebb in the opposite direction.

Turn island lies nearly 5 miles N.W. by N. from the south entrance of the Middle channel. Its eastern point, a cliffy bluff, makes as the extreme of the peninsula which forms the north side of Griffin bay. The island should be passed at a distance of over half a mile, particularly going northward with the flood; there is a channel for boats or small craft between it and the peninsula.

Turn rock lies nearly a quarter of a mile N.E. from the island, and covers at high water, and is marked by an iron spindle, surmounted by a white cage. The tide sets with great strength over this rock, and those passing up or down the channel are recommended to give it a good berth.

Friday harbour is rather confined, but offers good anchorage, and is easily accessible to steam-vessels or small craft. Brown island lies in the entrance, and there is a passage on either side of it.

The passage westward of Brown island is the wider, being 3 cables across. In the centre of this entrance there is a rocky patch of $3\frac{1}{2}$ fathoms.

Anchor in 9 fathoms, mud bottom, with the west cliffy point of Brown island bearing N.N.E. $\frac{3}{4}$ E., and the south point of same island bearing E. $\frac{1}{2}$ S.

Reid rock, the least water on which is 12 feet, lies in mid-channel; it is marked by kelp, which, however, is sometimes run under by the tide. The rock lies $1\frac{3}{4}$ miles W.N.W. from the north point of Turn island, and there is a clear deep channel on either side of it.

A nun buoy, coloured in red and white horizontal stripes, marks this shoal.

Wasp islands are on the eastern side of the channel, between and among which are several passages leading between Shaw and Orcas islands, and communicating with the harbours, which deeply indent the southern coasts of the latter.

Rocky bay, on the western side of Middle channel, $\frac{1}{2}$ miles from Caution point, does not afford much shelter, and it is not recommended to use it unless in case of necessity. The small island, O'Neal, lies in the centre of it. There is a depth of 14 fathoms between the island and San Juan, but the bottom is rocky. A reef, on which the sea generally breaks, extends $1\frac{1}{2}$ cables off the San Juan shore, bearing S.W. by S. from O'Neal island.

Jones island lies in the northern entrance of Middle channel, on the eastern side, nearly half a mile from Orcas island. The island is less than one mile in extent, mostly wooded, but its western points are bare and grassy.

Spring passage, between Jones island and the west side of Orcas, saves some distance to a steam-vessel passing up or down Middle channel, by the Douglas channel. It is one mile in length, 4 cables in breadth at its narrowest part, with an average depth of 15 fathoms.

Some rocky patches extend one cable off the eastern side of Jones island; and a rock which covers at 2 feet flood lies the same distance north of a small cove on the north-east side of the island; a rocky patch, with five fathoms on it, lies 2 cables off the west side of Orcas island, and $6\frac{1}{2}$ cables N.E. by E. from the north-west end of Jones island; therefore, it is desirable to pass through in mid-channel.

Passing up or down Middle channel, the north-east end of San Juan should be avoided as the tidal streams are strong, and a sailing-vessel is apt to be drawn into the strong tide-rips and overfalls in the eastern entrance of Spieden channel.

Flattop island, in the northern entrance of Middle channel, 2 miles N.W. by W. from Jones island, is one-third of a mile in length, wooded, and about 100 feet high. At 2 cables off its western side is a rock nearly one cable in extent and 25 feet above high water.

DOUGLAS CHANNEL, also called President channel, is the continuation of Middle channel and leads into Haro strait, between Orcas and Waldron islands. There are other passages leading into the Haro strait, viz., westward of Flattop island, between it and Spieden and Stuart islands; and eastward of Flattop, between it and Waldron island. In the former, the confused tides and eddies are liable to entangle a sailing-vessel among Spieden and the neighbouring groups of small islands and rocks; in the latter, White rock with its off-lying dangers offers serious impediments to the safe navigation of the same class of vessels.

If necessary, there is temporary anchorage in 12 fathoms in the bay, about 4 cables southward of the bill of Orcas.

Directions.—The channel westward of Flattop island is less than one mile wide at its narrowest part. Green point of Spieden island is steep-to; a tide-rip is generally met with off it. After passing Flattop island, the channel course is N.W. by N. until Skipjack island opens of Sandy point (Waldron island), bearing N. by E. $\frac{1}{2}$ E., when a course may be shaped either up or down Haro strait; with the ebb, be careful not to get set into the channel between Spieden and Stuart islands.

The channel eastward of Flattop island, between it and White rock, is about the same breadth as the one just described, but Danger rock, with 5 feet on it, which lies a quarter of a mile S.E. by E. from the centre of White rock, must be carefully avoided.

After passing Flattop island, keep its eastern side just touching the western point of Jones island, bearing S.E. $\frac{1}{4}$ E., and it will lead nearly three-quarters of a mile westward of Danger rock; when Skipjack island opens out northward of Sandy point, bearing N. by E. $\frac{1}{2}$ E., all the dangers are cleared.

If passing between White rock and Disney point (the high stratified cliff off Waldron island), the latter should be kept well aboard if the ebb is running, or a vessel is liable to be set on the rock. The west

bluff of Sucia should by no means be shut in by the southern part of Waldron island (these two points touching lead three-quarters of a mile eastward of Danger rock, but it must be remembered the ebb sets strongly down on it), until Monarch head is well shut in with Sandy point, the latter bearing N.W. $\frac{1}{2}$ N., steer through with these marks on, and when White rock is in line with the west side of Flattop island, bearing S. $\frac{1}{2}$ W., a vessel will be clear of all dangers, and may steer either up or down Haro strait, giving Sandy point a berth of half a mile.

Tidal streams.—Those in sailing-vessels working through Douglas channel should beware of getting too close over on the Waldron island shore, near Disney point as with calm or light winds they would run the risk of being set by the ebb on to Danger rock, on which the kelp is seldom seen. Both flood and ebb set fairly through Middle and Douglas channels, at the rate of 2 to 5 knots.

The ebb stream, coming down between East point and Patos island, strikes the north point of Waldron island, and one part of it, together with the stream between Patos and Sucia islands, passes down Douglas and Middle channels. The other part sets between the Skipjack and Waldron island; thence southerly through the groups in the neighbourhood of Stuart island into Haro strait, as well as down Middle channel. It should be observed that the ebb stream continues to run down through the whole of the passages in the archipelago, for $2\frac{1}{4}$ hours after it is low water by the shore, and the water has begun to rise.

PATOS ISLAND lies $2\frac{3}{4}$ miles E.N.E. from East point of Saturna; the passage between them being the widest, and at present most frequented, though it is not always the best channel from Haro or Middle channels into Georgia strait. Patos is $1\frac{1}{2}$ miles long in an east and west direction, narrow, wedge-shaped, sloping towards its western end, and covered with trees. Active cove at its western end is formed by a small islet connected at low water, and affords anchorage for one or two small vessels in 2 fathoms, but a strong tide-rip at the point renders it difficult for a sailing-vessel to enter.

The passage into Georgia strait between Patos and Sucia islands, although considerably narrower than the one just mentioned, is for several reasons at times to be preferred, especially for vessels passing

through Middle channel or for sailing-vessels with a N.W. wind. The tidal streams are not so strong, more regular, and set more fairly through; the passage is $1\frac{1}{2}$ miles wide, and is almost free from tide-rips.

LIGHT.—Patos or Alden point light is *fixed red* of small power.

Fog signal.—A trumpet gives blasts of *two seconds* duration, followed by a silent interval of *eighteen seconds*.

Directions.—If intending to take the passage between Patos and Sucia islands, either up or down, an excellent mark for clearing the Plumper and Clements reefs (dangerous patches lying southward and northward from Sucia) is to keep the remarkable round summit of Stuart island (642 feet high) just open westward of Skipjack island, the westernmost wooded island north of Waldron, bearing S.W. $\frac{1}{2}$ S.; this leads well clear of both the reefs, and the same marks would lead across Alden bank in 4 fathoms.

If taking the passage from the Middle or Douglas channels, keep the white-faced cliffs of Roberts point well open westward of Patos island, the cliffs bearing N.N.W. $\frac{1}{2}$ W., until the marks before described are on, when steer through the passage. If the ebb stream is running, it is better to keep the Patos island shore aboard; 16 fathoms will be found on the Sucia shore, but it is not recommended to anchor unless positively necessary.

If standing north-eastward, Clark island, open of the east end of Matia, or Puffin islet, the former bearing E.S.E., will lead eastward of Clements reef.

SUCIA ISLAND is indented on its eastern side by bays and inlets; Sucia harbour, the largest of these, affords fair anchorage. The island is from 200 to 300 feet high, thickly covered with pines, and its western side a series of steep wooded bluffs.

Plumper reef, or West bank, with 10 feet on it, lies $1\frac{1}{2}$ miles S.W. by S. from Lawson bluff, the highest north-west point of Sucia island. There is a deep passage between Plumper reef and Sucia island, but it is not recommended.

Clements reef, on which there is a depth of 8 feet, lies $1\frac{1}{2}$ miles N.E. $\frac{1}{4}$ N. from Lawson bluff. Some rocky patches covering at high water, and marked by kelp, lie between Clements reef and Ewing

island, and it is not safe to pass between them. There is a deep channel about one mile wide between Sucia and Matia.

Clements reef is marked by a red nun buoy at a quarter of a mile north-eastward of the reef.

Directions.—Entering Sucia harbour from the northward, steer for it, with the west point of Clark island in line with Puffin islet, about S.E. by E., which leads between Alden bank and Clements reef; when Ewing island bears S.W. by S., alter course to about South, giving the point of the island a berth of at least 3 cables, to avoid some rocky patches which extend 2 cables S.E. from it. When the harbour is well open steer up the centre W. $\frac{1}{2}$ S.; it is better to keep the southern or Wall island shore rather aboard, as it is quite steep, and there are some reefs extending one cable off the north shore.

Anchor in the centre in 7 or 8 fathoms, mud bottom. If intending to stay it is desirable to moor, as the harbour is small for a large vessel; it affords good shelter from westerly winds; with those from south-east some swell sets in but never sufficient to render the anchorage unsafe.

If entering from Douglas channel, keep Orcas Bill just touching the south bluff of Waldron island, bearing S.W. $\frac{3}{4}$ S.; this leads well westward of Parker reef.

If bound to Sucia harbour from Rosario strait, pass on either side of Barnes, Clark, and Matia islands as convenient; if northward of the latter, as soon as the harbour is open, steer for it, keeping the southern side aboard as before directed, do not stand so far westward as to shut in the north part of Sinclair island with Lawrence point, in order to avoid Parker reef.

Parker reef lies in the passage between Sucia and Orcas islands; at low water it uncovers a quarter of a mile of rock and sand, but its eastern end always shows its rocky summit which is just awash at high water. It lies $2\frac{1}{2}$ miles N.E. $\frac{1}{4}$ E. from Nob point (Orcas Bill). There is a passage on both sides of the reef; that northward between it and Sucia is one mile wide, with depths from 35 to 55 fathoms; that southward, between it and Orcas, is half a mile wide, with depths from 6 to 8 fathoms, but a stranger is recommended not to use it, as the points of Orcas at this part run off shoal.

If the northern passage is used, the north part of Skipjack island, kept in line with the south extreme of Pender island bearing W.S.W., leads well clear of Parker reef. A part of the ebb stream, setting down between Sucia and Matia islands, runs westward strongly over Parker reef, and through the channels on both sides of it; the flood sets in the contrary direction.

A patch of 3 fathoms lies a quarter of a mile W.S.W. from Parker reef, with 4 to 5 fathoms extending one-third of a mile from its west side.

Matia island, about one mile eastward from Sucia, is about one mile in extent, east and west; on its southern side are several boat coves. Close off its eastern extreme is Puffin islet, off which a flat rock extends $1\frac{1}{2}$ cables.

Skipjack and Penguin islands are small islands lying close off the north side of Waldron island; the former is considerably the larger, and is wooded; the latter is small, grassy, and bare of trees. A reef which covers, and is marked by kelp, lies between the two, but between this reef and Skipjack island there is a narrow passage of 8 fathoms. The tidal streams, however, set strongly between the islands, and it is not recommended; neither, for the same reason, is the passage between them and Waldron island unless to those thoroughly acquainted with the navigation.

LOPEZ ISLAND, the southernmost island on the eastern side of Middle channel, is 9 miles long, N.N.W. and S.S.E., and 3 miles wide, thickly wooded, but differs from all the other islands of the archipelago in being much lower and almost flat, except at its northern and southern extremes, where elevations occur of a few hundred feet. Its southern side is much indented by bays and creeks, which, however, from their exposed position and rocky nature, cannot be reckoned on as anchorages.

Mackaye harbour, on the south coast of Lopez island, 2 miles eastward of the entrance to Middle channel, is entered between Jennis point on the south, and Long and Charles islands on the north; from the latter it takes an easterly direction for one mile, and then trends southward for a short distance, terminating in a low sandy beach. In the entrance there are depths of from 8 to 12 fathoms, muddy bottom, but with the prevailing south-westerly winds the anchorage is a good deal exposed; with northerly or

See chart, No. 2,689.

easterly winds there would be fair anchorage. Coasters or small vessels drawing 12 feet may get shelter in the south bight; Jennie point should be passed at about 3 cables distant; the anchorage is $1\frac{1}{2}$ miles from it.

With south-westerly winds the coast and islands on the eastern side of Middle channel entrance, between Whale rocks and Jennie point, should be avoided, as then a considerable sea sets in; and when passing the coast between Jennie point and Cape Colville, it is desirable to keep one mile off shore, as some straggling rocks exist, which will be treated of under the head of Rosario strait.

Shark reef, on the western side of Lopez island, immediately within Middle channel, and half a mile northward of White cliff, consists of two rocks awash at low water, extending a little over one cable off shore, and must be avoided when working up the channel. Large vessels working up are recommended not to approach nearer than a quarter of a mile.

Careen creek, on the west side of Lopez island, is 4 miles from the south entrance of Middle channel, and its entrance lies 2 miles E. $\frac{1}{2}$ N. from Turn island. The western entrance point is a low sandy spit, close round which there are 3 fathoms water, and on it a vessel might, in perfect shelter, be beached and repaired with much facility; the creek terminates in a large salt lagoon.

Upright channel, separating Lopez from Shaw island, is a deep passage, leading from Middle channel to the sounds Orcas and Lopez, and by several passages into Rosario strait. The narrowest part is scarcely 2 cables wide.

Flat point is a low shingle or sandy point, with grass and small bushes on it, steep-to.

Canoe island is fringed by kelp, and a rock marked by kelp lies one cable South of its south point. The tidal streams are not considerable in Upright channel, seldom over 3 knots, and it is in all respects a safe passage.

Anchorage may be had in 6 or 7 fathoms in Indian cove, westward of Canoe island, with Flat point in line with the south point of Canoe island; the only precaution necessary is to avoid the rock off the south point of the island.

Shoal bay, close eastward of Upright hill, extends S.S.E. one mile to its head, and is separated from False bay in Lopez sound by

See chart, No. 2,689.

a low neck of land one cable across. Although apparently a considerable sheet of water, the anchorage for large vessels is much limited by a shoal which extends more than half way across from just within the point of Upright hill towards the eastern point of the bay; the shoal then extends up the bay to its head, leaving the greater half on the western side, with no more than from 2 to 3 fathoms at low water.

The best anchorage for large vessels is in 8 fathoms with Upright point (the west point of the bay) in line with the east point of Shaw island, bearing W. $\frac{3}{4}$ N., one cable inside this position there are 4 fathoms; the holding ground is good.

LOPEZ SOUND, on the eastern side of Lopez island, extends S.S.E. for $7\frac{1}{2}$ miles. Its eastern side is formed partly by Lopez and partly by Decatur and Blakely islands, lying parallel with it; and between these islands, as well as northward of the latter, are passages leading into Rosario strait. The average breadth of the sound is nearly $1\frac{1}{2}$ miles, and there is a convenient depth of water for anchorage in almost every part of it.

Middle bank, on which there are not less than 3 fathoms, is half a mile in extent north and south, 2 cables east and west, and lies almost in the centre of the sound, its north end being a quarter of a mile S.S.E. from the south end of Frost island. Between Middle bank and Houston island there is anchorage in any part of the sound in from 5 to 7 fathoms, mud bottom.

Just abreast Maury passage (between the south end of Decatur and the north-east point of Lopez), the water deepens to 13 and 15 fathoms, and this depth is maintained for $1\frac{1}{2}$ miles, or as far as Crown islet, a small steep rocky islet on the eastern side, within one mile of the head of the sound.

Tidal streams.—There is but little stream of tide felt in Lopez sound, unless in the immediate neighbourhood of the narrow passages from Rosario strait.

Entrance shoal, with 2 fathoms on it, and marked by kelp, lies $1\frac{1}{2}$ miles N.E. by E. $\frac{3}{4}$ E. from Upright point, and half a mile from the shore of Blakely island; there is deep water on either side of it.

False bay (also called Swifts bay) is on the west side of the sound, one mile from Shoal bay. A shoal, of 2 fathoms, extends from the centre of False bay, and connects with the small island Arbutus, lying in its entrance, and renders it unfit for anchorage except for small vessels; but vessels may anchor in 8 fathoms southward of Arbutus, between it and Frost island.

Half-tide rock, covering at half flood, and not marked by kelp, is in the track of vessels entering. It lies three-quarters of a mile S.E. by E. $\frac{1}{2}$ E. from Separation point. It is better to pass eastward of it, when it is not visible; the point of Upright hill kept just open of Separation point, bearing W. by N. $\frac{1}{2}$ N., until the clay cliff of Gravel spit is in line with the east point of Arbutus island, bearing S. by E., will lead clear of it.

Frost island, half a mile long north and south, lies close off Gravel spit on the west side of the sound; it is wooded, and its western side a steep cliff, between which and the spit end there is a narrow channel with a depth of 5 fathoms.

Black and Crown islets.—Black islets are a ridge of steep rocky islets, lying within and across the entrance of Maury passage; at 2 cables S. by W. from the southernmost of these islets is a rock which covers at quarter flood. There is a passage of 8 and 9 fathoms on either side of Crown islet, and anchorage above it in 5 or 6 fathoms, but do not proceed far above, as at one-third of a mile it shoals to one and 2 fathoms, and dries for a considerable distance from the head of the sound; there is also good anchorage in 5 fathoms in the bight, westward of Crown islet.

Passing up the sound between Crown islet and the western shore a rocky patch of 2 fathoms must be avoided; it lies a quarter of a mile W. by N. from Crown islet, and 4 cables from the western shore of the sound; there are 12 fathoms close to it, and deep water in the passage on either side of it.

THATCHER PASSAGE, between Blakely and Decatur islands, is the widest and most convenient passage into Lopez sound from Rosario strait; it is $1\frac{1}{2}$ miles in length, and its narrowest part 4 cables wide, with a general depth of from 20 to 25 fathoms.

The tidal streams in Thatcher passage run from 2 to 4 knots.

Lawson rock, lying almost in the centre of the eastern entrance, covers at 2 feet flood. It lies 4 cables N.W. by N., from Faundlerov

See chart, No. 2,689.

point. There is a good passage on either side of the rock, but that to the southward is the better.

The southern edge of Lawson rock is marked by a can buoy, painted red and black in horizontal stripes.

Directions.—Entering Thatcher passage from the southward, if the flood is running, the south shore should be kept pretty close aboard, as until well within the passage it sets up towards Lawson rock.

When the passage between Decatur and James islands is shut in by Fauntleroy point, a vessel will be just westward or inside the rock.

Those entering by Thatcher passage, and drawing over 18 feet, should avoid the Middle bank by keeping the south shore aboard within 2 cables; White rock in line with the south point of Blakely island leads over the tail of the shoal in 20 feet.

The flood stream sets from Rosario strait through Thatcher passage both up and down the sound; a slight stream of flood also enters the sound from the northward.

Maury passage, between Decatur island and the north-east point of Lopez, is the southernmost entrance to the sound from Rosario strait. It is scarcely 2 cables wide at the entrance, with a depth of 12 fathoms; the Black islets lie across the western entrance, and it is necessary to keep to the southward, between them and Lopez.

OBSTRUCTION PASSAGES.—Obstruction island lies in the centre of the channel, between the north point of Blakely and the south-east point of Orcas island, and the passages on either side of it form safe and convenient communication, by Upright channel, between the Middle channel and Rosario strait; they likewise lead from Rosario strait to Orcas and Lopez sounds. These passages are more adapted to steam than sailing vessels, although there would be no difficulty with a leading wind and fair tides. Small vessels would find no difficulty if the tides were properly taken advantage of.

LIGHTS.—A *fixed white light* is exhibited from a post on the north-east point, and a *fixed red light* from the south-west extreme of Obstruction island.

North Obstruction pass is about 1½ miles long, its average breadth 2 cables, the narrowest part (less than two cables) occurring

just after making the bend ; the general depth is from 8 to 14 fathoms. In consequence of the bend in this channel it has more the appearance of a bay, when seen from either entrance. The east end of Obstruction island should not be approached nearer than one cable, as shelving rocks extend a short distance off it ; the best course for a steamer is to keep in mid-channel.

South Obstruction pass, though narrower than the North, is the better of the two, as it is not more than three-quarters of a mile in length, and is straight N.E. and S.W. Its narrowest part is one cable wide ; the depth much the same as in the northern pass. On the south side of the eastern entrance two rocks extend off Blakely island, the inner being always above high water ; the outer, a long black rock, is nearly a quarter of a mile off shore, is just awash at high water, and is marked by an iron spindle surmounted by a white barrel.

Entering from Rosario strait, the pass should be brought well open bearing S.W. before approaching it nearer than half a mile ; in like manner when passing into Rosario strait, if the black rock is not seen, a N.E. course should be maintained until at that distance from the eastern entrance. When the west point of Burrows island opens eastward of the east point of Blakely island, bearing S.E., a vessel will be half a mile eastward of any dangers. The south side of the pass appears like a round wooded island, in consequence of the land falling abruptly behind it, where there are two lagoons.

Tidal streams.—The flood stream in both passes sets westward from Rosario strait, and the ebb eastward ; the latter runs for nearly two hours after it is low water by the shore ; the strength varies from 2 to 5 knots.

SHAW ISLAND is much of the same character as Lopez, though considerably smaller, being about 3 miles in extent ; between it and Orcas island lie the Wasp group, among which are several passages leading to Orcas and Lopez sounds, and into Rosario strait.

WASP ISLANDS, five in number, besides some smaller islets and rocks, lie on the eastern side of Middle channel, between Shaw and Orcas islands.

Yellow island, the westernmost of the group, is rather remarkable from its colour, grassy and nearly bare of trees, the

remainder of the group being wooded; from its west end a sandy spit extends one cable, having at its extreme a rock which dries at low water, and around which kelp grows; this point should be avoided when passing up or down Middle channel.

Brown and Reef islands lie northward of Yellow island; off the western side of the latter a reef extends more than one cable and several rocks surrounded by kelp extend over one cable off the west side of Brown island. A depth of 4 fathoms is reported to lie between Brown and Reef islands.

Wasp passage leads through this group to Orcas sound and Rosario strait. With the assistance of the chart, a steam-vessel would find but little difficulty in passing through it, though the passage by Upright channel is to be preferred.

Crane island, on the northern side of Wasp passage, is wooded, and much larger than either of the Wasp group.

Pole passage northward of Crane island is so narrow (150 feet) that it appears joined to Orcas; this channel is only fit for boats.

LIGHT.—A *fixed red* light is exhibited from a pile on the north shore of Pole pass.

Nob islet is a remarkable round islet, 50 feet high, with two or three bushes on its summit; it lies just westward of Cliff island.

Directions.—Passing between Brown and Reef islands, where the channel is nearly a quarter of a mile wide, with a general depth of 9 fathoms, and a patch of 4 fathoms nearly mid-channel, Bird rock (awash at high water) may be passed on either side; the wider passage is eastward of it, between it and Crane island, where the channel is a quarter of a mile across, and has a depth of 15 fathoms.

After passing Bird rock steer southward of Crane island, between it and Cliff island and thence between Crane island and the north end of Shaw island.

Approaching the east end of Crane island, the channel narrows to one cable. The steep cliffy coast of Shaw island must now be kept aboard to avoid Passage rock, which lies $1\frac{1}{2}$ cables eastward of Passage island. Nob islet, just touching the north end of Cliff island, and just open southward of the south side of Crane island, leads one cable South of Passage rock, which is covered at 2 feet rise.

When Orcas nob is over the narrow passage between Double islands and the west shore of West sound, bearing N.N.W. $\frac{3}{4}$ W. a vessel is eastward of Passage rock, and may steer up West sound, or eastward for East sound, or Rosario strait. Passing out of West sound the same marks are equally good; steer down just westward of Broken point (a remarkable clifly peninsula on the north side of Shaw island) until they are in line, when steer for them, giving the south side of Crane island a moderate berth, and passing out of Wasp channel, as before directed for entering it.

If desired, pass into Wasp channel southward of Yellow island, between it and Low island (a small islet), thence northward of Nob islet, and as before directed, between Crane and Cliff islands.

There is another passage into Wasp channel southward of Cliff island, between it and Neck point, the remarkable western extreme of Shaw island. The breadth between them is one cable, but there is a patch of 4 fathoms, with kelp on it, in the centre of the passage. If taking this channel there is a reef lying S.W. $\frac{1}{2}$ S., and extending more than a quarter of a mile from the south-west end of Cliff island; this reef is sometimes covered.

These two latter passages are the shortest into Wasp channel for vessels from the southward. The eye will be found the best guide; a good look-out is necessary, and to a steam-vessel there is no difficulty.

Tidal streams.—The flood stream sets west in the eastern entrance of Wasp channel, but in the western entrance the flood from the Middle channel partially sets eastward, and causes some rippings among the islands, which may be mistaken for shoal water.

North passage.—This clear deep channel leading to Deer harbour, the westernmost port in Orcas island, is between Steep point and reef island. It is nearly a quarter of a mile wide, and the danger to avoid is the reef off the west side of the latter island. A patch of 2 fathoms lies nearly one cable S.W. by W. from the north-west point of Brown island.

ORCAS ISLAND is the most extensive in Haro archipelago, and contains the finest harbours. It is mountainous and in most parts thickly wooded, although in the valleys there is a considerable

portion of land available for agricultural purposes, and partially clear of timber. Its southern side is singularly indented by deep sounds, which in some places almost divide the island; this is particularly the case in the East sound, separated only from Georgia strait by a low neck of land one mile across. On the eastern side of this sound mount Constitution rises to an elevation of 2,420 feet, wooded to its summit. On the west side is the Turtle back, a long wooded range 1,600 feet high, and west of it, rising immediately over the sea, is the singular bare-top cone known as Orcas nob, a remarkable object when seen either from the north or south.

Deer harbour and West and East sounds are on the south side of the island; but on the western and northern sides there is no convenient anchorage. A vessel might drop an anchor, if necessary, southward of the Bill of Orcas (a remarkable projecting bare point, with a nob on its extreme), where 12 fathoms will be found within one cable of the shore; a small vessel might also anchor in $4\frac{1}{2}$ fathoms, just inside Freeman islet, a small islet in the bay two-thirds of a mile southward of the Bill.

The north coast is precipitous, except between the Bill and Thompson point, a distance of $2\frac{1}{2}$ miles; here occurs the low land at the head of East sound, and the points are shelving, with large boulder stones extending some distance off; immediately off this part of the coast is Parker reef.

Thompson point is bare and clifty; from it the coast forms a slight curve easterly to Lawrence point, distant 6 miles.

Lawrence point, the sloping termination of the high range of mount Constitution, is the eastern extreme of Orcas island; on its northern side it is a steep and almost perpendicular cliff, and from it the coast turns abruptly southward, forming the western side of Rosario strait.

DEER HARBOUR, the westernmost of the three ports of Orcas island, is conveniently entered from the Middle channel by North passage, or between the latter and Brown island. The harbour is one mile long in a north and south direction, and about the same breadth at its southern end; it narrows, however, rapidly, and terminates in a shoal creek, and fresh water streams fed from a lake. Fawn islet lies off the steep clifty shore of the west side of the harbour.

Between Fawn islet and the western shore is a passage one cable wide with 9 fathoms. A reef extends from the north side of Crane island; if working up the harbour, do not stand so far eastward as to shut in the east end of Cliff island behind the west end of Crane island; this will lead more than one cable clear of the reef.

Anchorage.—A convenient berth is in 7 fathoms, mud, half-way between Fawn islet and the eastern shore, or a snug anchorage, in 5 fathoms, will be found a quarter of a mile northward of the islet.

WEST ORCAS SOUND may be entered from Middle channel, either by Wasp or Upright passages already described (*see* page 146), or from Rosario strait by either of the Obstruction passes (*see* page 149). Having entered by Wasp passage, cleared Passage rock, and being off Broken point, West sound will be open N.W. $\frac{1}{2}$ N. for more than 2 miles, with Orcas nob immediately over the head of it. The sound is about three-quarters of a mile broad, with depths of from 10 to 16 fathoms.

Anchorage may be had in any part above Double islands, which lie close off its western shore, half a mile N.W. from Broken point, but the snuggest anchorage, and the best for vessels intending to make any stay, is either in White Beach bay, on the eastern shore, or in Massacre bay at the north-west head of the sound.

There is good anchorage in 9 fathoms, with Sheep islet bearing N.E. $\frac{1}{2}$ N.

Massacre bay is the continuation of the head of West sound, between Haida and Indian points, and the anchorage is nearly one mile above White Beach bay. Harbour rock, covering at one-third flood, lies almost in the centre of the bay, between the two entrance points, one-third of a mile W. $\frac{3}{4}$ S. from Haida point; it may be passed on either side in a depth of 9 fathoms. If to the eastward, Haida point should be kept within $1\frac{1}{2}$ cables; if to the westward, the eastern cliffy part of Broken point, and the eastern side of Double islands kept in line bearing S.E. $\frac{1}{2}$ S., leads nearly one cable westward of the rock; when Indian point bears South, good anchorage will be found in the centre of the bay in 8 fathoms, mud bottom.

HARNEY CHANNEL, between Orcas and Shaw islands, connects the West and East sounds of Orcas. It commences at Broken

point, and takes an easterly direction for 3 miles, when it enters Upright channel between Foster and Hankin points; the former is a low sloping green point, the southern termination of the peninsula which separates the two sounds; the latter is the eastern bluff wooded point of Shaw island. The depth of water in this channel varies from 20 to 30 fathoms, and its average breadth is half a mile, though it narrows for a short distance about its centre to a quarter of a mile.

The north side of Harney channel is a series of small bays with shingle beaches, and there is a deep cove two-thirds of a mile west of Foster point; just westward of this cove, and N.W. from Hankin point, is a rocky patch which lies more than one cable off shore, and covers at half flood.

Camp cove is immediately northward of Foster point; it is a convenient cove for boats, or a small vessel might anchor there in 6 fathoms; there is a good stream of fresh water running into it.

Shag rock, also called High Water rock, lies more than one cable from the shore, half a mile north-eastward from Foster point; it is awash at high water, and is marked by an iron spindle surmounted by a white barrel.

Blind bay is on the south shore, midway between Broken and Hankin points. A small round islet partially wooded lies in the centre of the entrance, and a reef covering at high water extends from its western point, almost choking the entrance on that side, but leaving a narrow passage close to the islet; a rock covering at a quarter flood also lies off the eastern side of the islet, leaving a channel of 5 fathoms almost equally narrow on that side, so that the bay is only eligible for coasters, which should keep the island close aboard when entering; the eastern side is the better.

Anchorage in 4 or 5 fathoms may be had with the islet bearing N.N.W., distant 2 cables.

EAST ORCAS SOUND.—Entering this sound by Upright channel, or through the Wasp passages and Harney channel, when abreast Upright hill, its entrance will be easily made out. If by the Obstruction passes, as soon as a vessel is at their western entrance, the whole length of the sound will be open bearing N.W. $\frac{1}{2}$ W.; remarkable conical hills, over 1,000 feet high, rise on both sides of

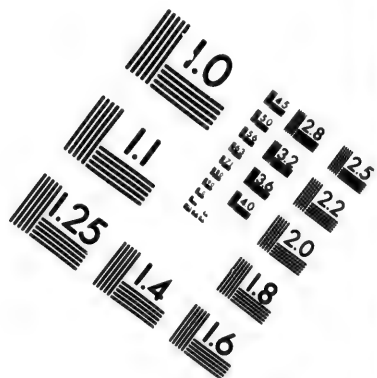
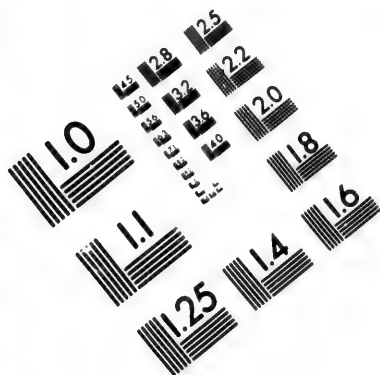
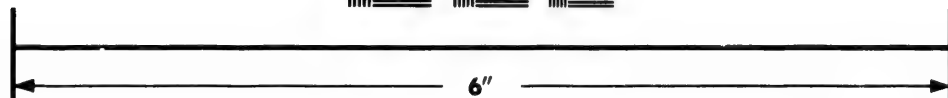
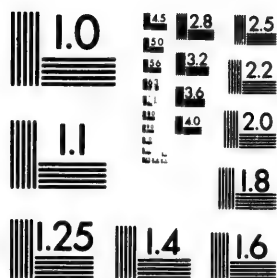


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the entrance, which is between Diamond and Stockade points. The general depth of water in the sound is 15 fathoms.

Stockade bay, on the eastern side of the entrance to the sound, nearly one mile North of Stockade point (the north-western entrance point of North Obstruction pass) affords anchorage in 8 fathoms, at about 3 cables from the shore ; with a strong S.W. wind some swell sets into this anchorage ; there is a good stream of fresh water running into the bay.

Green bank, on the western side, immediately opposite Stockade bay, is a bank of sand extending half-way across the sound ; on it there are depths of from 5 to 9 fathoms, with one patch of 4 fathoms, and a vessel might anchor on it if necessary, as being more convenient than the deep water immediately off it. The best anchorage is in 6 fathoms at half a mile North of Diamond point, with a small green islet, which lies just off a white shell beach, bearing West, distant about 4 cables.

Cascade bay, on the eastern side of the sound, 2 miles N.W. of Stockade bay, is formed by a small hook of land facing the S.E. Anchorage may be had at $1\frac{1}{2}$ cables from the beach in 10 fathoms ; but it would not be a desirable place with a south-easterly wind.

A large stream falls by a cascade into the above bay, and it would be a convenient place at which to water a ship.

Fishing and Ship bays.—Fishing bay, the westernmost of the two bays at the head of the sound, has good anchorage in 10 fathoms, with Arbutus point, the cliffy extreme of the jutting peninsula before mentioned, bearing N.E., midway between it and the west side of the sound.

Ship bay, eastward of Arbutus point, runs off shoal for 2 cables, or nearly to the extreme of the point ; but it affords good shelter, perhaps better than Fishing bay. There is good anchorage in 9 fathoms, mud bottom, with Arbutus point bearing W. by N., distant 3 cables.

See chart, No. 2,689.

CHAPTER V.

ROSARIO STRAIT AND SHORES OF GEORGIA STRAIT.

Variation $22\frac{1}{2}^{\circ}$ to 23° East, in 1898.

ROSARIO STRAIT is the easternmost and one of the principal channels leading from Juan de Fuca strait into that of Georgia. Its southern entrance is between Lopez and Fidalgo islands, and from thence its general direction is from N.N.W. to N.W. for 25 miles, when it enters the latter strait. Its western shores are formed by Lopez, Decatur, Blakely, and Orcas islands; its eastern by Fidalgo, Cypress, Sinclair, and Lummi islands, as well as by the mainland.*

Rosario strait has several smaller channels which branch eastward, and lead between islands to the United States settlements in Bellingham bay, or by a more circuitous route into Georgia strait; among the principal of these channels are Guemes, Bellingham, and Lummi. The greatest breadth of the strait is 5 miles at its southern entrance; the narrowest is about the centre, between Blakely and Cypress islands, where it is less than $1\frac{1}{2}$ miles; the depth varies from 25 to 45 fathoms, occasionally deeper.

The principal dangers are the Bird and Belle rocks, which lie almost in the centre of the strait, 4 miles within the southern entrance. There are several anchorages available for vessels delayed by the tides or other causes; Davis bay on the eastern side of Lopez island, 3 miles within the southern entrance; Burrows bay, immediately opposite it under mount Erie on the west side of Fidalgo island; Ship harbour or Guemes channel; and Strawberry bay, on the western side of Cypress island, are the principal.

Buoys.—A red nun buoy marks the north-east extreme of the shoal extending from Shannon or Ship point.

Buoys are also moored to mark the shoal extending from Frances point and the south end of the rocky patch between that point and Eliza island.

* See Admiralty chart :—Haro and Rosario straits, No. 2,689; scale, $m = 0.5$ inches.

Those entering Juan de Fuca strait, and bound to any of the ports of Puget sound, or up Rosario strait, either by day or night, should make New Dungeness light, which is 69 miles from the light at Tatoosh island (*see* p. 27), and then Smith or Blunt island.

Tidal streams.—The streams in Rosario strait are strong, from 3 to 7 knots in the narrower parts.

SMITH or BLUNT ISLAND lies almost in the centre of the eastern end of Juan de Fuca strait, 13 miles N.N.E. $\frac{1}{2}$ E. from New Dungeness, and 6 miles South from the entrance of Rosario strait. It is about half a mile in length, cliffy at its western end, and 50 feet high; a large kelp patch extends $1\frac{1}{2}$ miles from the western extreme, which should be avoided; there are 6 fathoms on its outer edge. From the eastern end of the island, which is low, a sand spit extends three-quarters of a mile N.E., partially covered at high water; on the north side of this spit there is anchorage in 5 fathoms, sandy bottom, about half a mile from the shore, but no vessel should lie here with any appearance of bad weather.

Beacon.—A beacon has been erected on Minor island, at the extremity of the spit extending from the eastern end of Smith or Blunt island.

LIGHT.—On the summit of Smith or Blunt island, near the west end, is a lighthouse painted white, with a black lantern, from which, at an elevation of 90 feet above the sea, is exhibited a *flashing white* light every *half minute*, visible in clear weather from a distance of 15 miles.

Tidal stream.—The ebb stream here, as in the narrower straits, runs from 2 to $2\frac{1}{2}$ hours after low water.

Directions.—Having made Smith island, which those bound from sea up Rosario channels should do on about a N.E. $\frac{1}{2}$ E. bearing, it may be passed on either side; but to the northward appears most convenient. When Dungeness lighthouse bears S. by W. keep it on that bearing, astern, steering N. by E., which leads midway between Smith island and the Fonté bank, lying 8 miles W. $\frac{1}{2}$ S. from it, on which the least water yet found is $3\frac{1}{2}$ fathoms.

When the lighthouse on Smith island bears E. by S. a vessel will be northward of the patch, and a course may be steered for

the entrance of the strait, which, however, should not be entered at night, until there is a light on Bird or Belle rocks, unless by those perfectly acquainted with the navigation, and the state of the tide.

If passing southward of Smith island, remember to avoid Partridge bank, the least water on which, $2\frac{1}{2}$ fathoms, is $3\frac{1}{2}$ miles W. by N. $\frac{1}{2}$ N. from Partridge point.

Those from the southern parts of Vancouver island, bound up Rosario strait, should pass northward of Smith island, avoiding Salmon bank, with 10 feet over it, off the south end of San Juan, and Davidson rock off Colville island. Mount Erie (on Fidalgo island) in line with Jennie point, bearing N.E. by E. $\frac{1}{2}$ E., leads $1\frac{1}{2}$ miles South of the former, and it is not recommended to pass the southern side of Lopez island at less than one mile distant, which will ensure clearing the latter; moreover, the coast is rocky, and the flood stream sets on to it. There are several indentations, with sandy beaches, on the south side of Lopez, which, although offering shelter for boats, are not recommended as anchorages for vessels.

Cape Colville, or Watmouth head, the south-eastern extreme of Lopez island, is the western entrance point of Rosario strait; Watmouth hill, flat-topped, and about 450 feet high, rises immediately over it.

Colville island, small, and bare of trees, about 40 feet high, lies one mile S.S.W. from the cape; close to the cape, and appearing from most points of view a part of it, is Castle island, a high precipitous rock. Entering the strait, Colville island should be given a berth of one mile.

Davidson rock, on which is a depth of 4 feet, and occasionally uncovering at low springs, lies a little more than 3 cables East from the east end of Colville island, and nearly one mile South from the cape itself; kelp grows about the rock, but the patch is so small that it is difficult to make out. A black can buoy, No. 1, in 26 feet, marks Davidson rock.

Kellett island, or cape St. Mary, kept open of the extreme of cape Colville, bearing N.N.W., leads half a mile eastward of the rock, and Eagle point (San Juan) kept open of the south end of Lopez island, bearing W. $\frac{1}{2}$ N., leads one mile southward of it.

Kellett island is a small flat-topped islet, covered with grass, lying immediately northward, and close off the low extreme of cape Colville.

Cape St. Mary, the next point northward of cape Colville, and a little more than one mile from it, forms the southern point of Davis bay.

Kellett or Hulah ledge, with one fathom on it, and marked by kelp, lies 3 cables N.E. by N. from cape St. Mary; there is a deep passage between it and the cape. When passing outside it, give the cape a berth of over half a mile.

Davis bay, also called Shoal bay, affords good and convenient anchorage in moderate depths. After rounding Kellett ledge, stand westward into the bay, and anchor in 6 fathoms, mud bottom, a little more than half a mile from the shore, with cape St. Mary bearing S.E. by S.; inside this the water shoals rather suddenly to $2\frac{1}{2}$ and 3 fathoms. A kelp patch, on which there is shoal water, lies one mile N. by W. from the cape.

There is anchorage in from 4 to 8 fathoms anywhere within one mile of the east coast of Lopez and Decatur islands, from a little northward of cape St. Mary, as far north as the white cliff of Decatur island, avoiding the kelp patches just mentioned, or while the Bird rock bears anything northward of East, and but little tide will be felt.

With the Maury passage open, bearing West, there is good anchorage, at from half a mile to one mile from the shore, in from 6 to 8 fathoms.

BURROWS BAY, on the eastern side of the entrance to Rosario strait, is well marked by mount Erie, a remarkable conical hill, rising 1,300 feet immediately over it, at one mile from the coast. The bay is sheltered from westerly and south-westerly winds by Burrows and Allan islands, and affords good anchorage to vessels wind or tide bound.

LIGHT.—A *fixed white* light is exhibited from the end of the wharf in Burrows bay.

Williamson rock, 22 feet above high water, lies in the southern entrance of the bay, half a mile south of Allan island.

Dennis rock.—There is a deep channel half a mile wide between Williamson rock and Allan island, but those taking it, or working up westward of the latter island, must avoid Dennis rock, which has 2 feet on it at low water and rarely uncovers. It lies nearly 6 cables N.W. by W. from Williamson rock, and the same distance W.S.W. from the south end of Allan island.

Anchorage may be had in 6 fathoms, with the passage between Burrows and Allan islands open, bearing W.S.W., half a mile from Young island; but the most sheltered anchorage is in 12 fathoms at the north head of the bay, half a mile from the eastern shore of Burrows island, with the passage shut in, and Young island bearing S. by W. $\frac{1}{2}$ W.; if, however, only a temporary anchorage is desired, the former will be found the most convenient.

Directions.—The best entrance, which is one mile wide, is eastward of Williamson rock, between it and Fidalgo island. The eastern shore of the bay is shoal for 3 cables off the beach, and in one spot a boulder, awash at low water, lies nearly 4 cables off, and nearly $1\frac{1}{2}$ miles E. by N. $\frac{1}{2}$ N. from the south point of Allan island.

Those from the northward may enter Burrows bay by the passage northward of Burrows island, or between the latter and Allan island; they are about an equal breadth, a little over 2 cables wide at their narrowest part, and lie nearly east and west; the latter is the straighter.

Tidal streams.—The ebb stream sets to the eastward into both passages, at the rate of 3 to 4 knots during springs.

DECEPTION PASS.—At 2 miles southward of the south entrance to Burrows bay is a narrow channel separating Fidalgo from Whidbey island, and communicating with Admiralty inlet and Puget sound; but it is only eligible for such small vessels or steamers commanded by those well acquainted with the locality. The tidal streams set through it with great velocity.

LIGHT.—A *fixed white* light is exhibited from the south-west extreme of Fidalgo island.

Lawson reef, on which there is a depth of $2\frac{3}{4}$ fathoms, is a ledge of small extent lying $1\frac{1}{10}$ miles S.W. by W. $\frac{1}{2}$ W. from the West point of Deception island at the entrance to Deception pass. A *bell*

buoy, painted red and black in horizontal stripes, marks the eastern side of the reef.

Bird rock, lying almost in the centre of Rosario strait, nearly 4 miles N. $\frac{1}{2}$ E. from cape Colville, is composed of three detached rocks close together, the southernmost being the largest, and 30 feet above high water. There is deep water close to it, but on account of the strong tidal streams, sailing-vessels working up or down, particularly during light winds, are recommended to give it a berth of half a mile.

There is an equally good passage on either side of the rock: that to the eastward is the wider (2 miles across); to the westward it is one mile wide, with somewhat less tide. By taking the latter channel with a leading wind, a stranger will more easily avoid Belle rock; passing Bird rock at a convenient distance, steer just outside, or to the eastward of James island, until the passage between Guemes and Fidalgo islands is open.

Belle rock, the most serious danger in the Rosario strait, only uncovers near low water, and the tidal streams set over it from 2 to 5 knots. It lies 6 cables N. by E. $\frac{3}{4}$ E. from the Bird rock, and in the passage between them are depths of 8 to 20 fathoms. Seamen, however, are recommended not to pass between them except in cases of necessity. The rock is marked on its north-west side by a black can-shaped buoy.

Belle rock is easily avoided by day; if passing to the eastward of it, keep Lawrence point, (the eastern point of Orcas island), in line with Tide point (the western extreme of Cypress island), bearing N.N.W., which will lead half a mile clear of it; when the passage between Guemes and Fidalgo islands is just open, a vessel will be more than one mile to the northward of it.

If taking the channel westward of Bird rock, keep that rock well eastward of cape Colville until Guemes channel is open. The great danger of the Belle rock to a sailing-vessel is being left with a light wind in the centre of the strait, as the water is deep to expect an anchor holding in so strong a tideway.

James island, almost divided in the centre, is a remarkable saddle island with a double summit, 250 feet high, lying close off the east side of Decatur island.

White and Black rocks are three-quarters of a mile apart, and lie off the south-east coast of Blakely island. White rock, the southernmost, is 16 feet above high water and a little more than a quarter of a mile from the shore at the eastern entrance of Thatcher passage.

Black rock, 14 feet high, lies three-quarters of a mile N.E. by N. from White rock, and half a mile from Blakely island; there is a deep channel between these rocks, as also between them and Blakely island.

An iron perch, 20 feet high, surmounted by a barrel, painted black and white in horizontal stripes, stands on the highest part of the rock.

BELLINGHAM CHANNEL, between Guemes and Cypress islands, is about $3\frac{1}{2}$ miles long and three-quarters of a mile wide in its narrowest part, between East point and Guemes island. Abreast the northern end of Guemes island, which is a steep bluff named Clark point and on the western side of the channel, are several small, high, wooded islets, named the Cone islets. Should the wind be light and the tide flood, pass close to Clark point to avoid being set past Sinclair island.

Guemes channel, south of Guemes island, leads into Padilla bay and eastward of the island to Bellingham bay. At the western entrance, on the southern shore, is Ship harbour.

City of Seattle rock, with a least depth of 9 feet, lies on the south side of the channel. A red nun buoy, in 14 feet, lies 35 yards E.S.E. of the rock, with the south point of Guemes island N.W. by W. $\frac{1}{2}$ W., and the wharf at Anacortes N.E. $\frac{3}{8}$ N.

LIGHT.—A *fixed white* light is exhibited on March point, Fidalgo bay.

Directions.—With strong flood tide and clear weather vessels pass through Guemes channel instead of through Bellingham channel. The usual route is through Bellingham channel and northward of Vendovi island.

With ebb tide small vessels use Hale passage. With flood tide pass between Viti rocks and Carter point, then across to the northward of Orcas island, passing between the island and Parker reef.

See chart, No. 2,689.

BELLINGHAM BAY.—The general direction of this bay is north and south ; it is 4 miles in width and 14 miles long, including the broad flats at either end. In the north-eastern corner of the bay are the villages Bellingham, Sehone, and Whatcom. There are coal mines near these villages, but the amount of coal is not great and the quality is poor. Half a mile from the shore there is good anchorage in 4 fathoms, soft sticky bottom. Underlying this soft bottom there is a stratum of sandstone, which prevents the anchor from holding, and vessels drag with south-easters, which blow strongly up the bay and raise a rough sea.

A boulder, with 8 feet over it, lies about midway between Frances point and Eliza island. A red and black buoy is moored near its southern edge.

A buoy, coloured black and red in horizontal stripes, moored in 18 feet about one cable off shore, marks the position of Starr rock, situated $1\frac{1}{2}$ miles S. by W. from the mouth of Whatcom creek. There is a depth of 4 feet over the rock.

LIGHT.—A *fixed white* light is exhibited on the edge of the bluff at William point.

CYPRESS ISLAND, north-westward of Fidalgo, forms a portion of the eastern side of Rosario strait. It is 4 miles long, by about 2 in breadth, and 1,525 feet high, it is thickly wooded with pine, and white cedar trees ; on its northern extreme, a remarkable bare, rocky cone rises immediately over the sea to 720 feet. A reef of boulder stones, some of which uncover, with kelp growing about them, extends half a mile off Reef point, the south-west point of the island ; the outer boulder covers at half flood ; it is marked by a black buoy.

Between Cypress and Blakely islands is the narrowest part of Rosario strait, being $1\frac{1}{2}$ miles across, and here the tidal streams during spring tides occasionally run between 6 and 7 knots.

Strawberry bay, on the western side of Cypress island, will be known by the small island of the same name, which lies immediately off it, $1\frac{1}{2}$ miles N.W. from Reef point, and protects the bay from the westward ; it is rather a confined anchorage, and at certain times of tide would be difficult of entrance to a sailing-vessel.

The bay is exposed to S.S.E. winds, which, however, do not frequently blow ; from S.E. it is sheltered, and there is no reason to

doubt but that, with good ground tackle, a vessel would ride out any gale. There is a passage of 10 fathoms northward between Strawberry and Cypress islands; and in the event of parting or slipping, run through this passage, and take shelter in Birch or Semiahmoo bays.

In a sailing-vessel do not attempt to enter the bay during the strength of the tide, unless with a commanding breeze, and remember that the tides set with great strength against the points of Strawberry island; it was remarked that, while the ebb was running strongly in Rosario strait, which it continues to do for $2\frac{1}{2}$ hours after low water, a stream of flood set to the northward through Strawberry bay, as soon as it was low water by the shore.

Anchor about 3 cables from the sandy bight of the bay, with the north bluff of Strawberry island bearing W.N.W., and the south point of this island S.W. by S., this is the best berth, in 7 fathoms, good holding ground, and nearly out of the tide, which sets with considerable strength inside Strawberry island.

There is a belt of flat marsh-land in Strawberry bay, through which several streams of good water run from the mountains.

Rock islet, a small round islet covered with trees, lying nearly 2 cables northward of the north end of Cypress island, has its shores scattered with large boulder stones. There is a passage of 9 fathoms water between it and Cypress island; but the ebb stream sets with great strength to the southward, and, indeed, close round the western points of the latter island.

Cypress reef, lying one-third of a mile W. $\frac{1}{2}$ S. from Rock islet, is a dangerous rocky patch, covering at half flood, with kelp growing about it. James island kept open of Tide point, the west point of Cypress island, bearing S. $\frac{3}{4}$ E., leads westward of the reef.

SINCLAIR ISLAND, thickly wooded, and comparatively low, lies north-eastward of Cypress island, with a deep passage, of nearly one mile wide, between them, leading to Bellingham channel. Shelving rocks project a short distance off its western shores.

Boulder or Panama reef, a dangerous shoal, extends nearly half a mile in a W.N.W. direction off the north-west extreme of Sinclair island, some parts of it uncovering at half-tide; a large boulder stands on the inner part of the reef. Great quantities of

kelp grow in the neighbourhood, but it is sometimes run under by the tide or concealed by the ripple; there are 6 fathoms close to the edge of the kelp.

By keeping Cypress cone open westward of Rock islet, or the strait between Cypress and Blakely islands well open, leads westward of this reef.

A red nun buoy is moored northward of the reef.

Peapods are two small rocky islets, bare of trees, lying half a mile from the western shore of Rosario strait, and from 1½ to nearly 2 miles southward from Lawrence point. They are three-quarters of a mile apart in a N.N.E and S.S.W. direction, the northernmost being the larger and higher. A little westward of a line drawn between them is a rock which just covers at high water.

Between Peapod islets and Obstruction pass, there is considerably less tide than in the main stream of the strait, and if necessary a vessel may drop anchor within half a mile of the shore in about 16 fathoms.

Lawrence point, the eastern extreme of Orcas, is a long sloping point, the termination of the ridge of mount Constitution; immediately on its north side it rises in high, almost perpendicular cliffs, and trends westward, falling back for 3 miles in a somewhat deep bight, which is rocky, and is unsheltered.

Anchorage may be had, if necessary, on the eastern side of Rosario strait, within one mile of the shore in 15 fathoms, between Sandy and Whitehorn points, northward of Lummi island.

Tidal streams.—After passing northward of Lawrence point, the ebb stream sets to the eastward between Orcas and the small islands to the northward of it as well as to the S.E. through the northern entrance of the strait; when in the vicinity of Alden bank, or about 8 miles N.W. of Lawrence point, the strength of the streams sensibly decrease, and while eastward of a line between this bank and Roberts point, a vessel will be entirely out of the strong streams of the archipelago and of Georgia strait; it is recommended during the ebb stream to work up on this shore.

LUMMI ISLAND is 8 miles long and very narrow. On its south-western side it is high and precipitous, a remarkable double mountain rising 1,560 feet abruptly from the sea; a small high double rocky islet lies close off the shore, 3 miles from its southern

point; foul ground extends from its north-west point; and at about 8 cables S.S.W. $\frac{1}{2}$ W. from Carter point, its south-east point, lies Viti rock. A reef extends 3 cables from this rock in an E. by S. direction.

A rock with a depth of 12 feet lies half a mile W.N.W. from Midgley point, the north point of the island. A nun buoy, with black and red horizontal stripes, lies westward of the rock.

Lummi bay opens north-eastward of Lummi island, and is backed by marshy ground. Into it by several mouths Lummi river empties. The main entrance of the river in the north part of the bay can only be reached by boats at high tide. Sandy point, the north entrance point of the bay, is low and grassy with a few bushes upon it.

Light.—A *fixed white* light is exhibited on Lummi point, the north-east extreme of the island.

Hale passage, east of Lummi island, connects with Bellingham bay. The northern entrance to the passage, three-quarters of a mile eastward of Midgley point, is barred by a ridge of 2½ fathoms. Towards the southern entrance the spit westward of Francis point is marked by a red nun buoy, and a red spar buoy marks the spit extending south-east of Frances point.

A shoal of 9 feet lies about midway between Frances point and Eliza island, and is marked by a red and black horizontally striped buoy on the southern edge.

Clark and Barnes islands are two small wooded islands, 2 miles N.W. from Lawrence point, two smaller islets, the Sisters, bare of trees, and a high rock lie immediately S.E. of Clark island. There is a narrow channel with a depth of 20 fathoms between Clark and Barnes islands, which a vessel may take if necessary.

The tidal streams set strongly about the Sisters, and the best and most direct channel is between Clark and Lummi islands. When taking this channel the north point of Lummi island should not be approached within one mile, as shoal and broken ground extends for some distance off it: Sinclair island kept just open westward of the north-west point of Lummi island leads westward of this foul ground in 15 fathoms, and when the east end of Matia island, or Puffin islet close off it, is in line with the north-west point (Bill of Orcas) bearing S.W. $\frac{1}{4}$ W., a vessel will be northward of it.

Matia island, 3 miles W.N.W. from Clark island, is one mile in length east and west, moderately high and wooded, and has some

coves on its southern side affording shelter for boats ; close off its east point is Puffin islet, and extending a short distance eastward of the islet is a flat rock which covers. Those bound through Rosario strait are recommended to pass eastward of Matia.

ALDEN BANK, 3 miles in extent north and south, one mile east and west, lies in the centre of the northern entrance of Rosario strait : its southern limit is 2 miles North of Matia island.

The depth on this bank varies from $2\frac{1}{2}$ to 7 fathoms, the bottom is in some parts rocky, with patches of kelp growing on it ; in other parts it is sandy, and offers a convenient anchorage when becalmed or waiting for tide. It frequently happens that having passed northward between East point and Patos island, a vessel meets the ebb stream, and is carried to the eastward ; in such a case it would be desirable to anchor in 7 or 8 fathoms on Alden bank, and thus prevent being set down Rosario strait.

A can buoy, painted red and black in horizontal stripes, is moored near the shoalest part of the bank.

Those passing up or down are recommended to pass on the eastern side of the bank.

Whitehorn point is a remarkable bold bluff about 150 feet high, its face showing as a steep white clay cliff. It is the southern point of Birch bay, and is 9 miles N.W. from the north point of Lummi island.

BIRCH BAY is between Whitehorn point and Birch point or South bluff : the latter, which is a moderately high rounding point, forms the north entrance point of the bay ; some large boulder stones stand a short distance off it, and should not be rounded at a less distance than half a mile. The bay trends N.E. for $2\frac{1}{2}$ miles, and is nearly 2 miles wide at one mile inside the entrance points ; the head of the bay dries off a considerable distance at low water, and the 3 fathom line extends $1\frac{1}{2}$ miles off shore in the centre of the bay ; it is open to winds from S.S.W. to West. The holding ground is good, and with S.E. gales it affords excellent shelter. A good berth is, in 4 fathoms, with Whitehorn point bearing South, distant one mile ; the water shoals gradually from 14 fathoms at one mile off to 6 fathoms between the entrance points ; inside this line, 4 fathoms only will be found for a further distance of one mile towards the head of the bay.

SEMAHMOO BAY, between South and North bluffs, affords good anchorage in from 6 to 8 fathoms, at about $1\frac{1}{2}$ to 2 miles outside Drayton harbour entrance; a good berth is in 6 fathoms, mud bottom, with South bluff bearing S. by E., and Tongue point bearing E. by N. This is always good anchorage, unless with a heavy S.W. gale, when vessels might take shelter in Drayton harbour.*

Fishing stakes fringe the shore, some extend into 11 fathoms and are marked by a *white* light.

An iron buoy lies with Semiahmoo post light N. by E., distant one-third of a mile.

LIGHT.—A *fixed red* light is exhibited on a cluster of piles in 24 feet water close to the steep sand bank, in the turn of the channel leading to Blaine.

Supplies.—Wild fowl frequent this anchorage in considerable numbers during the winter months.

DRAYTON HARBOUR, at $3\frac{1}{2}$ miles N. by E. from South bluff, is formed by a remarkable low narrow spit over one mile long. The spit is covered with grass and drift timber, and a few pine trees grow on it.²

Directions.—Outside Tongue spit a bank extends a considerable distance, do not approach the spit within three-quarters of a mile until its extreme point bears E. $\frac{1}{4}$ N., when it may be steered for and passed close-to. There is a depth of 4 fathoms at low water, in the fairway, at three-quarters of a mile outside the entrance; the channel is narrow, and no one unacquainted with the locality should enter before placing boats or poles on the edges of the shoals; when within, it opens into a considerable sheet of water, but it is for the most part shoal.

Anchorage.—The anchorage is in from 7 to 10 fathoms; it is perfectly sheltered, and affords room for 3 or 4 large vessels, as well as several small ones, and on the inside of the spit a vessel might be beached for repairs. The only landing at low water is at the spit end, which is steep-to.

Tides.—It is high water, full and change, at Drayton harbour at 2h. p.m.; springs range 14 feet.

* See Admiralty plan of Semiahmoo bay and Drayton harbour, No. 2,627; scale, $m = 4$ inches.

BOUNDARY BAY is between Roberts point on the west, and North bluff or Kwo mais point on the east, which bear S.W. $\frac{1}{2}$ S. and N.E. $\frac{1}{2}$ N. from each other, and are 7 miles apart. The bay extends in a northerly direction for nearly 7 miles, and is only separated from the south bank of Fraser river by a low delta 3 miles across, intersected by streams and swamps; it is very shallow and dries off 3 miles at low water, the edge of the bank in 3 fathoms water, extends $4\frac{1}{2}$ miles off the whole of the north shore of the bay.

Do not stand so far northward as to bring the white bluff of Roberts point to bear southward of S.W. by W.

Fishing stakes fringe the shore, some extend into 11 fathoms, and are marked by a *white* light.

Roberts point is the termination of a remarkable promontory which stretches southerly from the delta of Fraser river; the eastern point of the promontory is a remarkable white cliff, 200 feet high, its summit crowned with trees; from it the land gradually falls westward and terminates in Roberts spit, a low shingle point, within which is a small space of level clear land.

From the spit the coast trends N.N.W. with bluff shores of moderate height for $3\frac{1}{2}$ miles, when it merges into the swampy delta of the Fraser. From most points of view, and particularly from the southward, Roberts point presents the appearance of an island; shoal water and rocky irregular bottom, on which kelp grows in summer, extends for more than one mile E.S.E. from the point, and it is recommended to give it a good berth.

Boundary mark.—There is a granite monument 25 feet high erected on the summit of the Boundary bluff, which is only just visible from the anchorage on account of the trees; it marks the boundary between the British and United States possessions, or the 49th parallel of north latitude.

Anchorage will be found on either side of the promontory; eastward in 9 fathoms, sandy bottom, with the extreme of White cliff bearing W.S.W. distant $1\frac{1}{2}$ miles. Westward of the spit there is fair anchorage in 8 fathoms, good holding ground, with the spit extreme distant one mile, bearing S.E. by E. $\frac{1}{2}$ E.; do not anchor further northward.

Directions.—Feel your way cautiously by the lead into this anchorage; the bank is very steep outside, and shoals suddenly within.

Do not lie at the western anchorage with strong southerly or westerly winds, but shift round to the eastern, or to Semiahmoo bay, and give Roberts point a berth of 2 miles in rounding; neither of the anchorages at Roberts point can be considered as more than stopping places, and during winter, be prepared to weigh at short warning.

ROBERTS BANK, formed by the alluvial deposits of Fraser river, extends from Roberts spit W. by N. for $9\frac{1}{2}$ miles, to the Sand heads, at this point is 5 miles from the shore; it then takes a N.N.W. direction for a further distance of 12 miles, joining Grey point. The portion of the bank northward of Fraser river is named Sturgeon bank; it is steep-to, there being depths of from 70 to 60 fathoms at one mile from its edge, shoaling suddenly to 20, and then to 2 fathoms.

Two black beacons, 12 feet above high water, mark the edge of Roberts bank, and two similar beacons mark the edge of Sturgeon bank.

GEORGIA STRAIT.—Having passed out of Juan de Fuca strait by either of the channels before described, when north-westward of a line drawn between East point of Saturna island and Whitehorn point (mainland) a vessel may be considered in Georgia strait.*

CAUTION.—Buoys and beacons.—In consequence of the steepness of the shores and rapidity of tidal streams, buoys and beacons in Georgia strait are liable to be swept away, and should not therefore be implicitly relied on.

General remarks.—To those bound from sea, or from any of the southern ports of Vancouver island to Georgia strait, Haro channel is preferable, while to reach the same destination from Admiralty inlet or Puget sound, Rosario strait is the most direct and desirable. Having traversed either channel, the promontory of Roberts point will be seen, appearing as an island.

The dangers to be avoided when working through Georgia strait are, on the northern shore, Roberts and Sturgeon banks; and on the southern, the neighbourhood of East point, and Tumbo island, and the coasts of Saturna and Mayne islands, until beyond the entrance of Active pass. A chain of reefs and rocky islets lie parallel with

* See Admiralty charts:—Strait of Georgia, Nos. 579 and 580; scale, $m = 0.5$ inch.

this shore, in places extending nearly one mile off; and the bottom is rocky and irregular, with strong tides.

Extending one mile E.N.E. from the east end of Tumbo island is a ledge of foul, rocky ground, over which there are very heavy tide-rips, and dangerous overfalls. A large black conical buoy, in 12 fathoms, marks the extreme of the reef, with East point S. $\frac{1}{4}$ W., distant $1\frac{1}{4}$ miles. About 100 feet inshore of the buoy is a small patch of 2 fathoms, supposed to be remains of the wreck of the ship *John Rosenfelt*.

At $7\frac{1}{2}$ cables N.N.E. from Race point is a rocky patch of 5 fathoms, about 400 yards in extent, and at about 200 yards to the north-westward of this patch there is a rock with only 14 feet water on it. Orcas Nob kept well open eastward of the east point of Waldron island, bearing S.S.E. $\frac{1}{4}$ E., leads in the fairway between Saturna and Patos islands, $1\frac{1}{4}$ miles eastward of the rock; and Toe point (Patos island), in line with the north extreme of Sucia island, bearing E. $\frac{1}{2}$ S., leads nearly three-quarters of a mile to the northward of it.

A sunken rock, marked by kelp, with a depth of 2 feet on it and irregular soundings around, is situated $1\frac{1}{2}$ cables E. by S. from Edith point, north coast of Mayne island.

Caution.—As before observed (page 94), when possible, pass midway between Saturna and Patos islands; on no account give the East point of Tumbo island a berth of less than $1\frac{1}{2}$ miles, and it is recommended not to approach the northern shores of the islands lying between Haro strait and Active pass, within a distance of 2 miles; and it is strongly urged to adhere strictly to this advice.

The light on Georgina point, at the entrance to Active pass, becomes obscured when bearing westward of W. $\frac{1}{2}$ S.; and it should be borne in mind that during the night while this light is in sight all the dangers off the northern shores of the above islands will be avoided.

It should also be remembered that the ebb sets S.W., through Active pass, and that tide races occur in its northern entrance. Roberts bank is easily avoided.

The extreme of Roberts spit, or the tangent of the high trees immediately within it, should not be brought to bear to the southward of East; if the weather is thick, when 50 fathoms is struck, a vessel will be getting very near the edge.

The tidal streams, although not nearly so strong as among the Haro archipelago, yet run with considerable strength (3 knots), particularly during the freshets of summer, when Fraser river discharges an immense volume of fresh water, which takes a southerly direction over the banks almost straight for Active pass. The peculiar milky-coloured water is frequently carried quite across the strait, and is sometimes seen in the inner channels along the shores of Vancouver island; at other times it reaches the centre of the channel only, forming a remarkable and most striking contrast with the deep blue waters of Georgia strait.

Below the mouth of Fraser river, the stream is rather the stronger on the southern shore. On the northern side, within the line between Roberts and Sandy points, scarcely any stream is felt; and vessels will gain by working up on that shore, where good anchorage can also be found, if necessary.

Allowance must be made for the tides; this is not difficult when after having once entered Georgia strait by daylight, and noted which stream was running. In the centre of the strait above Saturna and Patos islands, the strength of the stream varies from one to 3 knots, seldom more, unless close to the southern shores, which are swept by the rapid stream out of Gabriola, Portier, and Active passes.

North-westward of the mouth of Fraser river there is still less stream and plenty of sea room, the breadth of the strait being nearly 15 miles.

FRASER RIVER, in point of magnitude and commercial importance, is second only to Columbia river on the north-west coast of America. In its freedom from risk of life and shipwreck, it possesses infinite advantages over any other river on the coast, and the cause of this immunity from the dangers and inconveniences to which all great rivers emptying on an exposed coast are subject, is sufficiently obvious. A sheltered strait, scarcely 15 miles across, receives its waters; and the neighbouring island Vancouver serves as a natural breakwater, preventing the possibility of any sea arising which would prove dangerous to vessels even of the smallest class, unless they ground.*

The river, with its numerous tributaries, has its rise in the Rocky mountains, between 400 and 500 miles from the coast in a northerly

* See Admiralty chart:—Fraser river and Burrard inlet, No. 1,922: scale, *m* = one inch.

direction, whence it forces its way in torrents and rapids, through one of the many great parallel valleys which intersect this region, confined by gigantic mountains, with large tracts of country, rich in agricultural resources on either side of them, until it reaches the town of Hope, which is about 80 miles by the windings of the river, in an easterly direction from its entrance.

Above the city of Lytton, which stands at the fork or confluence of Fraser and Thompson rivers, 55 miles above Hope, many rich deltas occur, or as they are termed by the miners, bars, and among these known as the wet diggings, gold was first discovered in British Columbia.

Midway between Langley and Hope, Harrison river falls into the Fraser, and by it and a long chain of lakes extending in a general N.W. direction a comparatively easy route has been established, by which the upper Fraser is reached at a point just below Bridge river, in the heart of the gold regions. Considerable attention has been attracted to the sulphur (temperature 164° Fahr.) springs of Harrison river.

Navigable depths.—The old channel, southward of the Sand head lighthouse, is entirely closed. The entrance to the present channel is $1\frac{3}{4}$ miles north-westward of the lighthouse, and as dams and training walls have been erected, it is considered probable that the direction of and depth in the channel will be maintained. As changes may occur, the following information and directions should be used with caution.

The least depth to be passed over between Georgia strait and New Westminster is about 12 feet at low water and 22 feet at high water springs, situated southward of English's cannery, about $5\frac{1}{2}$ miles within the entrance.

Vessels of 14 feet draught can proceed as high as Langley with ease, provided they have or are assisted by steam power, and are acquainted with the existing deep-water channel, which, it should be remembered, is subject to change. It must be remembered, however, that the tidal streams of Georgia strait sweep across the channel of the entrance, and to those in a large ship it is recommended to enter or leave with the last quarter of the flood.

Steamers of light draught reach Hope, and even the town Yale, 15 miles above it, during from six to nine months of the year. In June, July, and August, the melting of the snow causes so rapid a

downward stream that vessels even of high steam power are rarely able to stem it, and during these months numbers of large trees are brought down from the flooded banks, which offer another serious obstruction to navigation. Between Hope and Langley, the latter 30 miles from the river's mouth, there is always a considerable strength of current, from 4 to 7 knots, at times more; but at Langley the river becomes a broad, deep, and placid stream, and except during the three summer months the influence of the flood stream is generally felt, and vessels of any draught may conveniently anchor. The depth is 10 fathoms; the current not above 3 knots.

LIGHT.—From an iron pile lighthouse situated $1\frac{1}{2}$ miles southward of the river entrance is exhibited, at an elevation of 52 feet above high water, a *fixed white* light, visible in clear weather from a distance of 12 miles.

Fog bell.—During thick or foggy weather a bell will be sounded from the lighthouse, once every twenty seconds.

Position.—Lat. $49^{\circ} 5' 30''$ N., long. $123^{\circ} 17' 20''$ W.

Rise and fall of the river.—The river is at its lowest stage during the months January, February, and March. In April it commences to rise from the melting of the snows, and is perhaps 2 feet above its lowest level; the flood stream is strong enough to swing a ship at New Westminster up to the end of this month. In May the water rises rapidly, the river is at its highest about the end of June, and remains up with trifling fluctuations until the end of July or middle of August. During these six weeks the banks are overflowed, and extensive plains above Langley covered for a space of several miles; the strength of the stream between Langley and Hope being from 4 to 7 knots, and in the narrow parts even more. The usual rise of the river at Langley due to these floods is about 14 feet, but it has been known to reach 25 feet.

From the middle to the end of August the waters begin to subside, and in September the stream is not inconveniently strong. September, October, and November are favourable months for the river navigation, as the water is then sufficiently high to reach Hope, and the strength of the current considerably abated. The shallow stern-wheel steamers have got to Hope as late as December; between this month and April, owing to the shoalness of the water and the great quantity of ice formed, navigation, even by these vessels only drawing 18 inches, is attended with great difficulty, and rarely

practicable at all. The snags or drift trees which become imbedded in the river also form a serious obstacle to navigation at this season.

In April the steamers commence again to run; in June, July, and August the rapidity of the current is the great obstacle, but these high-pressure vessels, commanding a speed of 11 and 12 knots, frequently accomplish the voyage, though at much risk.

Bucys and beacons.—A black beacon with ball lies 7 cables S.W. by W. from the lighthouse. A red bell buoy lies half a mile south-west of the river entrance. A beacon is placed on Old North sand head S. by E. $1\frac{1}{2}$ miles from the lighthouse; and the western edge of Sturgeon bank is similarly marked by two beacons N.N.W. distant 4 miles, and $7\frac{1}{2}$ miles respectively from the lighthouse. These beacons are each a cluster of three piles surmounted by a cross; they are coloured black, and the positions are approximate.

The channel into the river is shewn by red buoys on the south side, and black buoys on the north. A beacon is placed on the east side of Westham island, on the south bank of the river, $2\frac{1}{4}$ miles within Garry point; and two small spar buoys mark the sides of the channel (Woodward slough) eastward of the beacon.

Tides gauges are placed on the northern side of the entrance channel abreast No. 6 black buoy, and on the east side of Annacis island, nearly one mile from the north end.

Directions.—Coming from the northward, Passage island at the entrance of Howe sound, kept in line, or just open eastward of a remarkable peak on Anvil island within the sound, bearing N. by W. $\frac{3}{4}$ W., leads $1\frac{1}{2}$ miles clear of the edge of the Sturgeon bank.

Having made the Sand-head lighthouse, and the bell buoy, steer for the entrance, and enter the channel, leaving the black buoys within close on the port hand, and the red buoys close on the starboard hand, up to Garry point. Keep within one cable of that point, and of the shore eastward, nearly as far as English's cannery, which is about 9 cables eastward of Garry point. Then bring that cannery to bear N.N.W. astern, and with it on that bearing cross over to the Westham island bank, keeping about one cable off up to the beacon on that island. Thence alter course to the eastward and pass between the two small spar buoys at the entrance of Woodward's slough. Steer in mid-channel, rather on the northern side of the river, through Woodward's slough and Graves-end reach; thence southward of Annacis island, keeping towards

the south shore through the first bend, then in mid-channel to New Westminster.

Tides.—It is high water at full and change at Fraser river entrance at 5h. 0m., springs rise 7 to 10 feet.

The time of high water is about 2 to 3 hours later at New Westminster than at the entrance of the river, and the rise and fall due to tidal causes at springs, is 6 feet, and at Langley scarcely perceptible. There are nearly always two tides in the lunar day.

The state of the weather in Georgia strait, the rains, and the amount of water in the river, affect the tides. Vessels will seldom swing to the flood stream until October, the change of tide at other times being shewn by a decrease in strength of the ebb or down stream. In September the ebb has been observed to run 3 or 4 knots, and the flood $1\frac{1}{2}$ knots, the water being quite fresh.

Ice.—On 1st January 1891 the ice in the river off New Westminster was 4 inches thick.

New Westminster stands on the north or right bank of Fraser river, just above the junction of North Fork, and 15 miles in a general north-easterly direction from the entrance proper. It occupies a commanding and well chosen position, being within an easy distance of the entrance, and having great facilities for wharfage along its water frontage, a good depth of water, and excellent anchorage.

Vessels moor abreast New Westminster in mid-channel, where the depth is $6\frac{1}{2}$ to 7 fathoms, sand and mud bottom.

The river bank is somewhat precipitous in places, and the country at the back is like all the lower parts of Fraser river (unless, indeed, in the immediate neighbourhood of the entrance, where it is swampy grass land, subject to inundation during the freshets of summer), densely wooded; a considerable clearing, however, of the timber has taken place in the vicinity of the town, which assumes a prominent and thriving aspect. It has several public buildings of note, including a very good hospital, and large canneries.

The site of the former military establishment, one mile above New Westminster, is a most picturesque spot, commanding an uninterrupted view of the Queen's reach, a broad, deep, and magnificent

sheet of water. From it to port Moody (at the head of Burrard inlet, and a station of the Canadian Pacific Railway) the distance is 4 miles in a north direction ; several good roads exist between the two places, and a branch railway line has been constructed between port Moody and New Westminster ; also a waggon road to the outer (Vancouver) harbour of the inlet. Liverpool, on the south side of the river opposite New Westminster, is connected with Seattle by railway. The population of New Westminster in 1894 was about 8,000.

Supplies of all descriptions are readily obtained, and salmon in abundance in the season. There are not many facilities for repairs to shipping and machinery.

Coal can be obtained. About 500 tons are usually kept in stock, but any quantity can be procured at a short notice. Vessels can coal from barges, or they can go alongside a wharf, which extends into a depth of 20 feet at low water.

Pitt river.—At 5 miles eastward of New Westminster is the entrance to Pitt river, which trends in a general direction from N.N.E. to N.E. for 28 miles, terminating in two remarkable lakes enclosed between almost perpendicular mountains, and navigable (for those that can pass the railway bridge) to the head for vessels of 14 feet draught, the depth in places being far too great for anchorage. A large tract of low grass land lies on both sides of the entrance of the river, which, however, is generally overflowed, or partially so, during 6 weeks of summer.

Derby or New Langley.—The landing place at fort Langley, is 12 miles above New Westminster in an easterly direction, on the south or opposite side of the river ; the channel between is deep, and there are no impediments to navigation. This spot was first selected as the capital, and as a town site it is unobjectionable, having a considerable tract of good cleared land in its neighbourhood, and all the requirements of a commercial port ; the depth of water here is 10 fathoms. Vessels may proceed with ease 7 miles beyond Langley ; the navigation then becomes somewhat intricate, and the current too rapid for any vessels but steamers of light draught and great power.

North Fork is another entrance to the Fraser, navigable for vessels of light draught at high water, and is generally used by the natives proceeding to or from Burrard inlet. Its junction with the

main stream occurs immediately below New Westminster, from whence it runs in a westerly direction, and enters Georgia strait through Sturgeon bank, about 5 miles northward of the Sand heads ; a large low partially wooded island (Sea island) lies in its entrance, and splits the channel into two arms.

In many parts of North Fork the water is deep, in holes, and the bottom irregular ; It can only be considered a boat channel.

BURRARD INLET is the first great harbour which indents the shores of British Columbia north of the 49th parallel. Its entrance is between Grey point on the south and Atkinson point on the north.*

Grey point, a long wooded promontory terminating in a rounded bluff, is very conspicuous from the southward, while Bowen island, which lies at the entrance of Howe sound, and may also be said to form the northern boundary of the inlet, is very remarkable ; its high, round, and almost bare summit, mount Gardner, reaching an elevation of 2,479 feet, is easily recognised from any point of view. Passage island, small, but prominent, lies in the eastern passage of Howe sound, midway between Bowen island and Atkinson point, and is an excellent mark from the southward.

Burrard inlet differs from most of the great sounds of this coast in being comparatively easy of access to steam-vessels of any size or class, and in the convenient depth of water for anchorage which may be found in almost every part of it ; its close proximity to Fraser river, with the great facilities for constructing roads between the two places, and its having become the terminus of the Pacific and Canadian Railway, likewise add considerably to its importance. It is divided into three distinct harbours, viz., English bay or the outer anchorage ; Vancouver (formally called Coal harbour), above the First narrows ; and port Moody at the head of the eastern arm of the inlet.

LIGHT.—From a square wooden lighthouse situated on Atkinson point is exhibited, at an elevation of 95 feet above high water, a *revolving white light*, attaining its greatest brilliancy *every minute*, visible in clear weather 14 miles. The light is obscured when bearing eastward of N. 72° E.

Fog signal.—A horn gives a blast of six seconds duration at intervals of 58 seconds.

* See Admiralty plan :—Burrard inlet, No. 922 ; scale, $m = 2\cdot0$ inches.

Pilots.—A small pilot vessel usually cruises between point Grey and point Atkinson, or will be at anchor near Spanish bank, or in Skunk cove half a mile eastward of Atkinson point lighthouse.

ENGLISH BAY is more than 3 miles in breadth at the entrance between Grey and Atkinson points, which bear from each other N.N.W. and S.S.E., and has the same breadth for nearly its entire length or almost 4 miles.

The head of English bay on the south shore terminates in a shoal arm named False creek; on the north shore it leads by First narrows to Burrard inlet. The great volume of water which discharges itself from the upper parts of the inlet through these narrows has scoured out a deep channel on the north side of the outer anchorage.

Spanish bank contracts the entrance in some measure, it is composed of hard sand, and is dry at low water; its edge is steep-to, and when covered its existence would not be suspected; there is no ripple on it unless with strong westerly winds, and then only near low water.

A pile beacon with red ball stands on the extreme northern edge of the bank, this beacon dries at low water; and a red can buoy, surmounted by a staff and cage, is moored in 10 fathoms, westward of the bank.

Anchorage.—There is good anchorage in English bay in 6 fathoms, stiff mud bottom, at about half a mile from the south shore of the bay (off Indian huts), with west extreme of Prospect point bearing N. by E. $\frac{1}{2}$ E., and lighthouse on Atkinson point W. by N. $\frac{3}{4}$ N.; this anchorage is well protected from westerly winds by Spanish bank; anchorage may also be had further to the eastward, if desired.

If intending to pass above the narrows, attend to the tides, and a stranger will do well to anchor in English bay before proceeding further up.

Tides.—In English bay it is high water, full and change, at 7h. 0m.; springs rise 13 feet, neaps 11 feet. During the winter months from September to March there is what is locally called a "short run out" during the day, and a "long run out" at night. The tide is consequently high during the day, and low at night. The duration of the short run out is from 3 to 4 hours, that of the long 7 to 9 hours. This is entirely reversed during the summer months, when it is high water during the night, and low water

during the day. The tides are very complicated, and cannot be depended on, except at full and change of the moon.

FIRST NARROWS or Lion's gate are on the north side of the inlet, where the breadth of the channel is not more than $1\frac{1}{2}$ cables with a depth of from 10 to 12 fathoms; to a stranger the entrance is not easily made out until close in.

Directions.—A flat composed of shingle and boulder stones, covering with the early flood, extends from one to 3 cables off the north shore, so that Prospect point must be kept pretty close aboard, rather less than one cable.

In a sailing-ship a knowledge of the locality is necessary, as well as a commanding breeze, and the narrows should never be attempted with the full strength of the stream; and you must be quick and careful with the helm. Even for a steam-vessel the strength of the streams in First narrows necessitates unusual care.

The narrow part of the channel is half a mile in length, when it gradually opens out from 2 cables to half a mile, which is the breadth abreast Brockton point. When past the narrowest part, the south shore should be kept aboard within 2 cables until abreast Brockton point. A spar buoy, painted red, is moored in 3 fathoms, at the edge of the bank on the south side of First narrows, with Brockton point lighthouse bearing E. $\frac{1}{4}$ S., distant 4 cables. Three beacons mark the edge of the bank, which dries at low water, on the northern side of the narrows.

Two white masts, each 30 feet high, stand on Brockton point, the eastern one surmounted by a triangle; the rear mast bearing S. 72° E., distant 195 feet, from the front mast.

Two white masts, each 20 feet high and surmounted by a drum, stand on the shore southward of Parthia shoal.

The beacons on Brockton point in line, bearing S. 72° E., lead in a least depth of $5\frac{1}{4}$ fathoms southward of Parthia shoal, from a position with one of the beacons (20 feet high, with drum, as above mentioned) abeam or bearing about S. 18° W. until the other beacon is abeam.

When the tidal streams are running with any strength, there are eddies in First narrows, and it is necessary to exercise caution, especially with heavy draught vessels, in passing through. A stranger should not enter the narrows unacquainted with the state of the tide.

Parthia shoal lies in mid-channel north-westward of Brockton point. Its extent, within the 5-fathoms line, is $3\frac{1}{2}$ cables long, east and west, and $1\frac{1}{2}$ cables broad, and the least water is $3\frac{1}{2}$ fathoms near the east end. A second bank of 25 feet, with 7 fathoms between, lies one cable north-eastward of Parthia shoal. The passage for large vessels is southward of the shoals with (should the beacons be down) the chimney of the sugar refinery in line with Brockton point E. by S. $\frac{1}{4}$ S.; passing Brockton point at a distance of 200 yards.

Burnaby shoal, about 2 cables in extent, with 9 feet on it, lies $3\frac{1}{4}$ cables E. $\frac{1}{4}$ N. from Brockton point; the kelp, however, is frequently not seen until close to. It is marked on its north-eastern edge by a red spar buoy, moored with eastern extreme of Brockton point West, distant 3 cables.

Tides.—The strength of the tide in the narrowest part of the First narrows is from 4 to 8 knots. It is high water, full and change, at 7h.; rise 13 feet.

VANCOUVER HARBOUR, the anchorage inside First narrows, is a bight formed by the land falling back from Brockton point; midway between Vancouver town and Hastings mill, Whiting bank extends $1\frac{3}{4}$ cables from the shore, with $2\frac{1}{4}$ fathoms on its outer edge.*

LIGHT.—On Brockton point a *fixed white* and *red* light is exhibited on a mast, at an elevation of 51 feet above high water. The *red* sector is shown between S. 83° W. and N. 67° W. (30°).

Fog signal.—A bell is struck once every 25 seconds.

Vancouver, a rapidly increasing town, is situated on the eastern side of Vancouver harbour; it is the terminus of the Canadian Pacific Railway, and trains leave daily for Montreal. It is in telegraphic communication with Vancouver island and Montreal. There are excellent facilities for beaching vessels.

The depths alongside the Canadian Pacific Railway wharf are 24 to 26 feet at low water.

The pier, half a cable eastward of Buckland point, has a depth alongside it at low water of 24 feet.

* See Admiralty plan :—Vancouver harbour, No. 922; scale, $m = 4.0$ inches.

At Hastings saw-mill there are several piers with a depth of 25 feet alongside the largest.

The population in 1891, numbered 13,685.

Communications.—There is regular steam communication between Vancouver town and Japan, China, Sandwich islands, New Zealand, Australia, San Francisco, and ports in Puget sound in connection with the Canadian Pacific Railway; and mails for Australia, China, and Japan are conveyed by this route. The steamers from China coal at Vancouver from a hulk; they call at Esquimalt.

There is railway communication with New Westminster.

Supplies.—Wood and coal are readily procured. Water is obtained from the principal wharves. The city is supplied with water from Capilano creek on the northern shore; the main pipe crosses First narrows from the eastern mouth of the creek.

Tides.—From observations, obtained at the Canadian Pacific railway wharf, in April, May, and June, it was H.W.F. & C. at 7 hours; on this day the rise was 11 feet. The greatest range however, viz., 13 feet, was observed from 2 to 4 days after full and change of the moon. The neap rise, usually occurring from 9 to 11 days after full and change, was 11 feet, and range 7 feet. At point Atkinson high and low water are about three-quarters of an hour earlier, and at port Moody a quarter of an hour later than at Vancouver. The streams, both flood and ebb, in First and Second narrows turn at high and low water by the shore.

The above observations shew a large diurnal inequality, which affects the high waters from a few inches to $4\frac{1}{2}$ feet, and the low waters a few inches to $9\frac{1}{4}$ feet. Two tides of unequal range usually occur in the 24 hours as follows:—Higher high water, higher low water, lower high water, lower low water. The greatest range follows the moon's maximum declination. The tide has the peculiarity of rising to nearly the same level at the higher high waters whether it be at springs or neaps, whereas the level of the low waters varies in the usual manner. In summer the higher tides occur at night, and in winter during the day.

Moodyville.—At Moodyville, on the north shore, there is a steam saw-mill, also a gridiron 180 feet long and 40 feet wide, capable at spring tides of taking a vessel drawing 12 feet; alongside

it is a small wharf. Steam ferry boats ply between this place and the several other settlements in Burrard inlet.

Hastings, a small village situated on the south side of the inlet is 3 miles eastward from Vancouver, and is connected with New Westminster by a road 9 miles long. It is much frequented during the summer months.

Anchorage.—The best anchorage in Vancouver harbour is in the south-east corner in from 10 to 12 fathoms, mud, with the north extreme of the piers at Hastings mill bearing E. by N., and the landing stage at Vancouver town (a long floating stage) bearing South. This position is out of the influence of the strong tidal streams.

Coal is obtained from Nanaimo and neighbouring ports, and the amount kept in stock is uncertain.

Tug.—A powerful steam tug is available for towing vessels between Juan de Fuca strait and Burrard inlet.

Second narrows are similar to the First; a bank of the same description, but more extensive, is caused by the deposit brought down from the high mountains by the numerous streams which flow into the inlet on the north side. This bank is dry at low water, and the breadth of the deep channel, at the narrowest part and for half a mile on either side of it, varies from $1\frac{1}{2}$ to 2 cables, with a depth of from 10 to 20 fathoms. The channel, however, is straight, and the tidal streams which run from 3 to 7 knots set fairly through it. The only directions necessary are to keep the south shore close aboard, and steer from point to point without going far into the bights which indent the coast on either side of the narrowest part. The great strength of the streams cease when half a mile from the narrowest part of either narrows.

A submarine telegraph cable crosses Second narrows in the narrowest part, marked by three posts placed on the mud flat; and the outer of these being on the southern edge of the flat is a good guide for the deep water channel.

PORT MOODY.—The entrance to this snug harbour is 4 miles eastward from Second narrows, at the head of the eastern arm of the inlet. It is 3 miles in length, and varies in breadth from one-third to half a mile, except at its entrance, where it is only 2 cables

across: there are no known dangers, and there is an uniform depth of water, with good holding ground. The port takes a N.E. by E. direction for nearly 2 miles, and then E. by S. for one mile, terminating in a muddy flat at its head, which reaches within 3 miles of the banks of Pitt river, and about 4 miles from the site of the military camp at New Westminster, on the Fraser. Wharfage accommodation for vessels of large tonnage is provided, the depth alongside which is 30 feet at low water.

Anchorage.—The best anchorage is in the widest part of the harbour just before reaching the arm which turns E. by S., in from 5 to 6 fathoms. Abreast the turning point, and on the north shore, a bank dries off for nearly 2 cables at low water.

NORTH ARM, 3 miles eastward of Second narrows, branches in a general northerly direction for 11 miles. It is entirely different in its character from other portions of the inlet. The depth varies from 50 to 110 fathoms, and it is enclosed on both sides by rugged mountains rising from 2,000 to 5,000 feet almost perpendicularly, and down the steep sides of which the melting snow in summer forces its way in foaming cascades, rendering the surface water in the inlet below nearly fresh.

There is scarcely sufficient level land in this arm to pitch a tent, nor is there any anchorage except in Bedwell bay, a narrow creek 2 miles within the entrance, on the eastern shore, where 7 to 9 fathoms are found near its head. North arm is nearly one mile wide at the entrance, but one mile within, it is contracted to a little over 2 cables, when it shortly opens out again, and maintains an average breadth of two-thirds of a mile as far as Croker island. There is a settlement on North arm named Richmond and there are salmon canneries there.

Tupper rock, in the approach to Bedwell bay, is of small extent with deep water around, and having 10 feet over it at low water. The rock lies 3 cables N.E. $\frac{3}{4}$ N. from Jug island, and is very dangerous to vessels entering Bedwell bay.

Croker island is one mile from the head of the arm, and on both sides of it there are deep but narrow channels; that to the eastward is the wider. The head terminates in a delta of swampy rushes, through which some rapid streams find their way into the inlet from a deep and narrow gorge in a N.N.W. direction.

SOUTHERN SHORE OF GEORGIA STRAIT.

GABRIOLA REEFS, a dangerous cluster of rocks, covering a space of nearly $1\frac{1}{2}$ miles, some of which cover at half flood, and others having only a few feet water over them, lie 2 miles off the eastern point of Gabriola island. There is a passage inside the reefs, but it is not recommended. Nanoose or Notch hill just open of Berry point (the north-east point of Gabriola island), bearing W. $\frac{1}{2}$ S., leads one mile northward of them.*

Thrasher rock, lying about 2 cables seaward from the northern end of the Gabriola reefs, is a detached rock which dries $1\frac{1}{2}$ feet in the kelp which marks the neighbourhood. There is a depth 11 fathoms within one cable of the rock on its seaward side, and between it and the Gabriola reefs there appeared to be a depth of about 5 fathoms over a rocky bottom.

Berry point bearing W. $\frac{1}{2}$ S. (well open of Flattop point), leads about one mile northward of Gabriola reefs and Thrasher rock. The entrance points of Portier pass just touching on a S.S.E. $\frac{1}{4}$ E. bearing, leads more than $1\frac{1}{2}$ miles eastward of the reefs.

Buoy.—A black can buoy, surmounted by a spindle and cage, is moored in $11\frac{1}{2}$ fathoms, one cable N.E. from Thrasher rock.

Caution.—Westward of Flattop island the shore of Gabriola is bold until near Berry point and Entrance island, when it should not be approached within a long half mile; foul ground extends for some distance eastward from the point of the island.

ENTRANCE ISLAND lies half a mile N.N.E., from Berry point, it is rocky, 30 feet high, formed of sandstone, bare of trees, but has some vegetation on it. Those passing up the strait bound for Nanaimo should round this island; there is a deep passage between it and Berry point named Forwood channel, a little more than 2 cables in breadth, which steam-vessels or small craft may use; but the south and west sides of Entrance island must be avoided, as reefs and broken ground extend 2 cables off them.

LIGHT.—From a square, white, lighthouse situated on Entrance island, is exhibited, at 65 feet above high water, a *fixed white light*,

* See Admiralty chart :—Strait of Georgia, Sheet 1, No. 579; scale, $m = 0.5$ of an inch.

with *red* sector between West and N. 83° W., over Gabriola reefs. Obscured by land when bearing northward of N. 83° W. The light should be seen in clear weather from a distance of 14 miles.

Fog signal.—A steam horn gives blasts of 8 seconds with silent intervals of 45 seconds.

Position.—Lat $49^{\circ} 12' 45''$ N., long. $123^{\circ} 48' 50''$ W.

FAIRWAY CHANNEL, between the shore of Gabriola and Lighthouse island, is the most direct for vessels entering from the southward or eastward.*

Lighthouse island is a smooth-topped grassy sandstone island, 3 cables in extent north and south, about 39 feet high, 3 miles W. by S. $\frac{1}{4}$ S. from Entrance island. A ledge of rocks, 4 cables long in a north and south direction, lies to the eastward of Lighthouse island; with the north end $2\frac{1}{4}$ cables E.N.E. from the south point of this island, and the south end $4\frac{1}{2}$ cables S.E. by E. from the same point; the least depth on this ledge is 7 feet on its northern edge, and 21 feet on its southern. The ledge is generally covered with streaming kelp, and has a channel of 7 fathoms between it and the island. The southern end of the reef is marked by a red can buoy in 9 fathoms, with the south end of the island N.W. by W. $\frac{1}{4}$ W., distant 5 cables. Lighthouse island is locally named Snake island.

Directions.—Having entered Georgia strait, between East point of Saturna and Patos island, a W.N.W. course for 38 miles will lead nearly 3 miles outside Gabriola reefs, and abreast Entrance island, the latter bearing S.W. distant 5 miles. When proceeding through Fairway channel, if northward of mid-channel, keep a look-out for the kelp on Lighthouse island ledge; when Lighthouse island bears N.W. steer S. $\frac{1}{4}$ W., which leads to the entrance of Nanaimo harbour, distant a little over 2 miles.

Strangers should be careful not to mistake Northumberland channel for it, which lies in a S.S.E. direction from Lighthouse island, between the high cliffy west coast of Gabriola island and Sharp point, a remarkable narrow projection on the main, and off which, at the distance of half a cable, is a rock which uncovers.

* See Admiralty plan:—Nanaimo harbour and Departure bay, No. 2,512; scale, $m = 4$ inches.

Having passed between Lighthouse and Gabriola islands, there is a good working space of $1\frac{1}{2}$ miles in breadth, between Gabriola on the east, and Newcastle and Protection islands on the west, but the water is too deep for anchorage. The shores of the latter islands should not be approached within a quarter of a mile, as shoal rocky ledges extend off them. Having brought Gallows point (the southern extreme of Protection island) to bear S.W. $\frac{1}{2}$ W., the town will come in view.

A vessel may anchor if necessary with the high-water mark of Gallows point bearing W.N.W., distant a quarter of a mile, which will be in the fairway of the entrance, but it is difficult for a sailing vessel to pick up a berth here with a strong breeze, as the space for anchorage is confined.

NANAIMO HARBOUR (on Vancouver island) is formed by Protection island (lying at a little over half a mile off shore) to the eastward, and Newcastle island to the northward; this latter island approaching the shore of Vancouver to within a distance of $1\frac{1}{2}$ cables, and forming a narrow strait affording communication with Departure bay to the northward.*

The entrance to the harbour lies between Gallows point on the north side and a bank of mud on the south side. A rocky ledge extends for $1\frac{1}{2}$ cables on all sides of the point, and in summer is marked by kelp; a large boulder stands on the ledge off the point, distant 150 yards, and covers before high water. The south side of the channel is the northern edge of the great shallow bay to the southward, which although it does not quite dry in this part, has only 2 or 3 feet on it at low water, and is steep-to. The harbour thence opens out, and when the banks are covered, gives the idea of being a large sheet of water, but the deep part is limited.

Buoys, and beacons.—A wharf projects 150 yards from the western part of Gallows point, into 24 feet water; two mooring buoys lie about half a cable off the cross-head of the wharf. The following now mark the channels into the harbour:—Gallows point buoy, No. 2, is red with staff and disc. On the south side of the channel are two black buoys with staves and top marks, Nos. 3 and 5, marking the shoal water off Nanaimo flats. On the south end of Middle bank is No. 6, red with staff and cage; and a red spar buoy near the edge of the bank. On the north end of the bank, a black beacon, from which a *white* light is exhibited.

* See Admiralty plan of Nanaimo harbour, No. 573; scale, $m = 12$ inches; also Nanaimo harbour and Departure bay, No. 2,512; scale, $m = 4$ inches.

A beacon of masonry, 14 feet high, surmounted by a staff and lattice-work ball, the whole painted black and showing 10 feet above water, has been erected on Beacon rock, Nanaimo, in lieu of the black buoy previously marking that rock.

A beacon, consisting of 3 piles painted black, displays a *red* light at a height of 10 feet above high water, and is situated on the south side of the channel, about 2 cables S.S.E. from Gallows point. The black buoy previously moored in this position has been withdrawn.

Southward of Satellite reef and marking the north side of North channel is No. 4 buoy, red with staff and cage. Carpenter's rock, off the town, is marked by a black buoy without distinguishing mark; and a black buoy, No. 9, with staff and triangle, is moored on the edge of the flat extending off Mill stream. There are also two mooring buoys off the coal wharves at Grave point.

The positions and shapes of the buoys are liable to be changed, and are therefore not to be depended on.

The town of Nanaimo contains about 4,600 inhabitants, but it is being continually added to by immigration. Extensive colliery works are in full operation, and the country around possesses exceptional natural facilities. Steamers call here from San Francisco, Portland, and Alaska, as well as from Victoria and coast ports, and there is communication with Victoria by rail.

Nanaimo is connected with Victoria and New Westminster by electric telegraph. The wharf accommodation is excellent.

Provision is made for sick seamen, who are either admitted to the Nanaimo hospital, or transferred to the marine hospital at Victoria.

A steam ferry runs between Nanaimo and Departure bay.

Middle bank, 2 cables long in a northerly direction, and half a cable broad, lies in the centre of the harbour, and has a depth of only 3 feet on it in places.

Beacon rock lies nearly one cable off shore abreast the northern pier.

Nicol rock has been removed by dredging. A tide gauge station, on piles, stands near the site of the rock.

Directions.—The jail, on the western side of Newcastle island passage, is conspicuous.

Two narrow winding channels, the North and South, lead into the usual anchorage, which is close off the town, and westward of the Middle bank; both are buoyed in the vicinity of the latter, but no stranger should enter either channel without a pilot.

North channel lies between the Middle bank (to the southward) and the south edge of the Satellite reef. South channel, though of sufficient depth for large vessels, has a somewhat sharp turn at its western end, but is very convenient for sailing-vessels leaving with a northerly wind, when they would be obliged to warp out of the North channel.

Anchor close off the town in 5 fathoms, midway between the north edge of Middle bank and Beacon rock. Vessels can go alongside the wharves.

A small creek on the north side of Douglas coal wharf affords excellent facilities for beaching a vessel, and is frequently resorted to for that purpose.

Supplies.—Beef and mutton may be procured, and the country around abounds in wild fowl and deer.

Ship stores can be obtained; but material necessary for refitting a vessel must be procured from Victoria. The facilities for repairing a ship's hull and machinery are limited, but small work connected with the latter might be executed at the machine shops.

Coal.—The mines of Nanaimo produce a fair bituminous coal, which answers well for steaming purposes. It is lighter by about 10 per cent. than Welsh coal, and its consumption proportionately rapid.

Two or more steamers can be coaled at the same time; the depth alongside the wharf at low water being from 15 to 25 feet.

The quantity of coal usually maintained on hand is 5,000 tons. Vessels can coal from lighters alongside at all times.

Newcastle island also produces large quantities, and the mines there are being rather extensively worked.

Tides.—It is high water, full and change, at Nanaimo harbour about 5 p.m., and the range of tide is sometimes 14 feet, which is as much as is met with anywhere on the coast, rendering this a most

eligible spot for the construction of docks, for which it offers peculiar facilities. This great range of tide only occurs at midnight during winter, and in the daytime in summer. The superior and inferior tides exist here as they do at Esquimalt and among the Haro archipelago.

DEPARTURE BAY.—From Nanaimo the long narrow channel or arm between Newcastle island and the main leads in a N.W. direction to Departure bay. It is $1\frac{1}{2}$ miles in length, and one cable in breadth, with 12 feet at low water, except on a rock which has only 2 feet water on it lying in the centre, $2\frac{1}{2}$ cables N.W. by W. $\frac{1}{2}$ W. from Reef point; this rock is marked by a black buoy. Vessels of 15 or 16 feet draught may enter Departure bay by this channel at suitable times of tide, but large vessels must enter northward of Newcastle island.*

The northern entrance to Departure bay is between Boulder point, the steep cliffy north point of Newcastle island, and Jesse island, a small island to the northward of it, and lies 2 miles S.W. $\frac{1}{2}$ W. from Lighthouse island; it is 3 cables wide and there is a depth of 20 fathoms in it. Very little less than this depth will be found in any part of the bay, and it is not nearly so sheltered as Nanaimo harbour. When coming from the northward, care must be taken to avoid the reef which extends more than $1\frac{1}{2}$ cables from Horswell bluff, the north entrance point of the bay. Fresh water can be obtained.

Coal.—The coal wharves in the south corner of the bay are, New Vancouver Company's pier with 37 and 33 feet alongside the cross heads, and East Wellington wharf, with 27 feet. The three wharves on the north-west side, inside Double island, have depths of 27, 29 and 24 feet respectively.

Three warping buoys have been placed for the convenience of vessels about to coal.

Black rocks generally show four heads, but at low water appear as one rock. There is a small rock with 6 feet over it 50 yards west of the westernmost Black rock, with 4 fathoms close-to.

Buoys.—The buoys in the bay and approaches are, No. 8, red with staff and ball, marking the reef off Newcastle island on the south-east side of the bay; three mooring buoys off the wharves

* See Admiralty plan of Nanaimo harbour and Departure bay, No. 2,512; scale $m = 4$ inches.

inside Double island ; red can, at edge of the shoal on the north shore inside Black rocks ; black can, eastward of the reef off Jesse island ; red can, in 6 fathoms off Horswell bluff reef ; black spar, on south side of West rocks ; and a red spar buoy at the eastern edge of Clarke rock.

Horswell bluff.—An isolated boulder, of very small extent, with 2 feet over it at extreme low water, lies on the 5-fathoms line three-quarters of a cable off shore, with the bluff N. by W., and the western point of Jesse island S.W. by S.

Directions.—When intending to load with coals bring the steep north point of Newcastle island to bear N. by E., and anchor in not less than 18 fathoms off the coal mine, 2 cables from the shore (or make fast to the mooring buoy until ready to haul alongside the wharf) ; the bank runs up steep within the above depth, and shoals from 12 to 2 fathoms. Unless anchored well out, a vessel is liable, with N.W. winds, to tail on the bank ; and ships are not recommended to lie here after they have got their cargo in. A stranger should take a pilot for the coaling station in Departure bay, either from outside or in Nanaimo harbour.

The passage from the northern wharves between Double island and Black rocks is safe. That northward of and between Black rocks and the red buoy is also used, but care must be taken to keep a little northward after passing the easternmost rock in order to avoid the 2 fathoms off their east end.

Middle channel, over one mile wide, lies between Lighthouse and Five Finger islands ; it has a depth of 80 fathoms. Passing through the centre of it, a S.S.E. course leads for Nanaimo harbour, between Protection island and Sharp point.

Five Finger island is a bare rugged islet 48 feet high, of about the same dimensions as Lighthouse island, but of trap formation, instead of sandstone ; the five hummocks on it resemble knuckles more than fingers.

West rocks.—Four cables S.S.W. from Five Finger island are three smaller islets of similar character and formation, with some rocks about them, which uncover. These islets and rocks occupy a space of half a mile in a W.N.W. and E.S.E. direction ; there is a passage 3 cables wide between them and Five Finger island with

irregular rocky bottom, the depths varying from 9 to 35 fathoms: it is not recommended, but, if used, Five Finger Island should be kept aboard.

Inner channel, 4 cables in breadth, lies between the above islets and the shore of the main, and being more direct, is convenient for steamers or small craft bound to or from the northward; the mid-channel course through it is N.W. Almost in the centre of this channel are the Clarke rocks, which dry 4 feet at low water. A red buoy is moored on these rocks.

NORTHUMBERLAND CHANNEL, before mentioned as lying between Sharp point and the western shore of Gabriola island, runs in a S.E. direction for $1\frac{1}{4}$ miles, and then East for 2 miles, when it enters the Dodd and False narrows, the former on the south side of Mudge island, the latter on the north: a rock which uncovers extends half a cable off the extreme of Sharp point. False narrows are shoal with no ship passage, but there is excellent anchorage in Percy bay at their western entrance, in from 7 to 10 fathoms, where vessels may lie to wait the tide through Dodd narrows.

A submarine electric cable crosses Northumberland channel three-quarters of a mile westward of Dodd narrows.

Dodd narrows have been already described (page 134) from the southward; they communicate with the inner channels leading to the southern ports, and save a distance of 20 miles in the passage from Nanaimo to Victoria or Esquimalt, and they are consequently frequented by boats, small vessels, and sometimes by steam-vessels of considerable size acquainted with the locality. Strangers are not recommended to use them. Coming down Northumberland channel, look out for the narrow entrance on the south side, and when it bears S.E. steer for it: the tidal streams run at their strongest 8 knots, and there is a very short interval of slack water; the breadth in the narrowest part is 80 yards. The tides in Dodd narrows are about one hour earlier than at Nanaimo, therefore a vessel intending to pass down should be at the narrows an hour before high water at that place, if going through with the first of the ebb: or at two hours before low water if with the last of it.

See chart. No. 579.

CHAPTER VI.

**GEORGIA STRAIT, FROM NANAIMO HARBOUR
AND BURRARD INLET, TO CAPE MUDGE AND
BUTE INLET.**

VARIATION, 24° East, in 1898.

GEORGIA STRAIT, as already observed, commences at the northern end of the Haro archipelago, and extends in a general W.N.W. direction to cape Mudge, a distance of 110 miles. There are many harbours, both on the Vancouver and continental shores; and several islands, some of considerable size, form other channels, all of which are navigable.*

The average width of the main strait westward of Nanaimo is about 9 miles, diminishing at its narrowest part, between Lasqueti and the Ballinae islands, to 5 miles. The general depth of water is great, frequently over 200 fathoms. The tides are not strong, and between Nanaimo and Mudge there are few dangers in the way of ships navigating the strait.

The smaller channels on the continental shore are Malaspina strait and Sabine channel, the former lying between the continent and Texada island, the other separating Texada from Lasqueti island.

On the Vancouver shore is Ballinae channel, lying westward of the islands of the same name; also Lambert channel and Baynes sound, the former between Hornby and Denman islands, and the latter dividing both from Vancouver island.

Tides and tidal streams.—The meeting of the tides takes place between cape Mudge and cape Iezo; that is to say, the flood entering by Juan de Fuca strait meets that entering by the north end of Vancouver island, within 20 miles of the former cape, generally much nearer, but varying according to the phases of the

*See Admiralty chart:—Strait of Georgia, sheet 1, No. 579; scale, $m = 0.5$ of an inch; also sheet 2, No. 580; scale, $m = 0.5$ of an inch.

moon and the state of the winds; and at the point of meeting a considerable race occurs, which would be dangerous to boats: there is generally such a race at the entrance of Discovery passage. It is high water, full and change, at cape Mudge and cape Lazo at about 5h. 30m., and the range during ordinary springs is from 12 to 14 feet. At the entrance of the passage during springs the tidal streams attain a velocity of 4 to 6 knots an hour, the flood, or easterly stream, being the stronger.

Winds.—The prevailing summer wind in Georgia strait is from N.W., or the same as on the outside coast, and between May and September it blows strong and steady, commencing about 9 a.m. and dying away towards sunset. These winds do not generally extend much below Roberts point, among the Haro archipelago they become variable and baffling, while in the main channels of Rosario and Haro the westerly wind entering the strait of Fuca is deflected to S.W., and vessels running up these channels with a fair wind will almost always find it ahead on entering Georgia strait. During winter there is a good deal of moderate, calm, and gloomy weather, but gales from S.E. and S.W. are frequent.

NANOOSE HARBOUR, at 8 miles westward from Nanaimo, is easily recognised by Nanoose or Notch hill, a remarkable hill 625 feet high, immediately over its north side, showing as a double or notch peak from the southward; the harbour trends 3 miles W.S.W. The entrance between Maude island and Blunden point is three-quarters of a mile wide, and the width of the harbour varies between 3 cables and over one mile.*

Leaving Nanaimo harbour, and passing out by either channel (Middle channel to be preferred), or being at from a half to one mile northward from Five Finger island, a W. by S. course, or straight for Nanoose hill, leads for the entrance of the harbour, distant 7 miles.

Winchelsea and Ada islands, a group of small wooded islands, lie off the north point of Nanoose harbour.

Maude island, small, wooded, and about 100 feet high, is the southernmost of the group, and lies three-quarters of a mile E.N.E. from the north point of the harbour. When working in stand pretty close to it and to Blunden point, but when inside the latter, a

* See Admiralty plan of Nanoose harbour on Sheet of Plans, No. 585; scale, $m = 3$ inches.

sand-bank dries for a considerable distance off at low water, and the south shore should not be approached within a quarter of a mile.

Entrance rock, 2 feet above high water, lies $1\frac{3}{4}$ miles W.S.W. from Blunden point, extending off a flat on the south side, almost into the middle of the harbour, and contracting the width of the passage to 3 cables; within this, the harbour opens out to nearly one mile in width, terminating at $1\frac{3}{4}$ miles in a shoal mud flat, which dries at low water more than half a mile, and where quantities of oysters are found.

A sunken rock, with a depth of 13 feet on it at low water, is situated in the entrance to Nanoose harbour, in a position with the centre of Entrance rock bearing S. $\frac{1}{2}$ W., distant $2\frac{1}{2}$ cables.

There is a depth of 4 fathoms close eastward of the above rock; and a rock with a depth of 5 fathoms on it, situated E. by N. $\frac{1}{2}$ N., distant 2 cables, from the 13 feet rock.

North rock, on the north shore, lies nearly 2 cables from the shore, and has a depth of 5 feet on the outer part.

Directions.—When midway between Maude island and Blunden point, the fair course is in W.S.W. When the east point of Southey island is shut in by the north entrance point, North rock will be passed, and the north shore should be kept rather aboard. Entrance rock should in no case be passed nearer than one cable, and if working in, beware of the North rock, and the sand-bank already mentioned as extending off the south shore, and which stretches also for a quarter of a mile westward from entrance rock.

No convenient anchorage in less than 18 fathoms will be found, until well up towards the head. When Nanoose hill bears North, anchor in 12 fathoms in the centre of the harbour, or as near to either shore as desired. It is a spacious anchorage, and well sheltered from all winds.

There is a convenient nook with a steep shingle beach, where a vessel might be laid for repairs if necessary, on the north side, one mile from the head.

Supplies.—Grouse are to be got here, beef in any quantity, and fresh water may be obtained from a cove at the head on the north side.

Tides.—It is high water, full and change, in Nanoose harbour, at 5 p.m.; springs range 15 feet.

The COAST for 6 miles westward of Nanoose is fringed with numerous small islands and reefs, the latter generally marked by kelp. The outermost of them, Winchelsea and Yeo islands, extend between one and 2 miles from the land.

Small vessels may find good shelter in Schooner cove at $1\frac{1}{2}$ miles westward of the north point of Nanoose harbour. There is a rock awash nearly in the centre of the entrance, but nearer to the north point.

Grey rock, bare, 12 feet above high water, and rather remarkable, lies 2 cables E.N.E. from the east end of Winchelsea group.

Rudder reef, with one fathom on it, lies a quarter of a mile S.E. $\frac{1}{2}$ E. from Grey rock, and has very little kelp on it. This reef must be avoided by those bound westward from Nanoose harbour, and the S.E. end of the Winchelsea islands should be given a berth of at least half a mile.

Yeo and Gerald islands lie westward from the Winchelsea group, and are smaller. They may be safely passed to the northward, at the distance of half a mile.

BALLINAC ISLANDS, two in number, are larger than the groups just described, and lie $2\frac{1}{2}$ miles off shore. They are about 250 feet high; the northernmost has only two or three trees on it, and its summit terminates in a sharp, bare nipple; the southernmost is wooded. They have the appearance of being one island seen from all points, being only separated by a narrow passage which at the eastern entrance is less than one cable wide, but opens out within, and forms a sheltered cove with anchorage for small vessels in 8 fathoms, close to its southern sandy beach; on the west side this channel is almost closed, and there is no passage into it. The islands are steep and bold on all sides, and are conspicuous after passing westward of Nanaimo.

Ballinac channel, southward of the islands of the same name, is a safe, clear passage, $1\frac{1}{4}$ miles in width at its narrowest part (abreast Gerald island).

To steamers, coasters, or vessels with a fair wind, Ballinac channel is recommended. Large sailing-vessels with a foul wind would find it an advantage to make long boards, and pass northward of the islands through the main strait.

Cottam reef has $2\frac{1}{2}$ fathoms on it, and is generally marked by kelp: it lies on the southern side, and $1\frac{3}{4}$ miles S.S.W. $\frac{1}{4}$ W. from the highest part of north Ballinac island. The northernmost of the Winchelsea islands kept open of Yeo islands bearing E. $\frac{1}{2}$ S. leads well northward of the reef.

North-west bay, 5 miles westward from Nanoose, is much exposed to N.W. winds and the water in it is very deep: a considerable stream flows into the bay at its western entrance.

Mistaken island, low, wooded, and half a mile long, lies close off its northern entrance point, and $2\frac{1}{2}$ miles S.W. $\frac{1}{2}$ S. from the north Ballinac island.

The COAST.—From North-west bay the land trends, with a slight indentation, nearly West for 19 miles to Denman and Hornby islands, and to the southern entrances of Baynes sound and Lambert channel. This stretch of coast presents no remarkable feature, wooded bluffs, of moderate height, terminating in sandy or shingle points, off which for a very short distance the water is shoal.

The land between Nanoose and Comox district, a distance of 24 miles, is undulating, and of a moderate height, from the sea-coast to the base of the mountain ranges, a distance of about 4 miles, and although generally densely wooded near to the sea, is lightly timbered a short distance inland, with some patches of prairie land.

Qualicum river disembogues 30 miles westward from Nanaimo, and 5 miles eastward from the eastern entrance of Baynes sound. It is a small stream, only noticeable as affording shelter to canoes or boats within its entrance, and as being the terminus of the trail between the head waters of Barclay sound and the eastern coast of the island, a distance of only 13 miles in a direct line.

A black can buoy is moored in 5 fathoms, about one-third of a mile northward of the river entrance.

Horne lake, from which this stream has its source, is $5\frac{1}{2}$ miles S. by W. from the river entrance.

Qualicum bay is a slight indentation of the coast, immediately westward of the river, where very fair anchorage will be found in 8 or 10 fathoms, at three-quarters of a mile from the shore, with the east point of Hornby island bearing N. $\frac{1}{2}$ W. : the holding ground is good, and northerly winds which would make it a lee shore seldom blow with any strength. From N.W. winds it is in a great measure sheltered by the islands, but with those from S.E. a considerable sea will get up, though there would be plenty of room, and with good ground tackle no danger of drifting.

The mountain ranges westward of Nanaimo are of considerable height, and very striking in their general features and varied outlines ; most conspicuous amongst them, and midway between Barclay sound and the east coast, rises mount Arrowsmith to a height of 5,976 feet, its remarkable summit terminating in three sharp well-defined peaks, rarely free from snow.

DENMAN and HORNBY ISLANDS lie immediately off the coast, 34 miles westward from Nanaimo : the former is 9 miles long in a W.N.W. direction, or parallel with the coast, and has an average width of 2 miles, its highest elevation being about 400 feet, and wooded.

Hornby island is about 4 miles across in every direction ; over its western side rises rather abruptly mount Geoffrey, a remarkable flat-top hill, 1,076 feet high, sloping gradually down on the east side and terminating in a low, bare, grassy point : on the eastern side is Tribune bay, affording good anchorage. On both these islands there is a considerable quantity of good land, particularly on the latter.

Denman island is separated from the mainland by a good passage called Baynes sound, and Hornby island from Denman by Lambert channel. There is more tide felt in the channel than in the sound ; in the former its rate is sometimes 2 knots, the flood coming from the south-eastward. The prevailing winds are north-westerly, therefore, for sailing-vessels from the southward, the main strait east of Hornby island is to be preferred.

Lighthouses are in course of erection at the south-east end of Denman island, from which leading lights will be shown to clear the shoal ground off Maple point.

BAYNES SOUND, separating Denman island from the mainland, is a narrow sheet of water 18 miles long, with an average navigable width of over half a mile, and with a general depth of

from 20 to 26 fathoms, so that, if necessary, an anchor may be dropped in any part; there are, however, two very fair anchorages, Fanny bay on the south or main side, and Henry bay on the north or island side. At 14 miles from the eastern entrance of the sound is port Augusta, into which flows Courtenay river, one of the largest streams in Vancouver island, and in this immediate neighbourhood is a large extent of good clear grass land.

The exit into Georgia strait by the north-west part of the sound, between the north end of Denman island and cape Iazo, is nearly two miles in width, but a remarkable bridge or bar of sand, scattered with large stones, extends the whole way across, and at low water there is as little as 8 feet on it; during summer it is thickly covered with kelp, which never altogether disappears. The bar is very narrow, and is always smooth: towards high water, vessels of 19 feet draught, by carefully paying attention to the leading marks and bearings may safely pass either into or out of the strait by this channel.

Yellow island is small and bare, 80 feet high, and generally of a yellow colour. It lies close off the south-east point of Denman island, is conspicuous, may be seen for several miles, and is a good object to steer for coming from the eastward, as it forms the eastern entrance point of the sound. Between Yellow island and Denman island there is no passage, the space being occupied by a stony ridge.

LIGHT.—A square white building with a red lantern stands on Yellow island, from which is exhibited at 120 feet above high water a *group flashing white* light. It shows three flashes, eclipses of 15 seconds intervening, followed by an eclipse of 30 seconds. Visible seaward in all directions, except where obscured by trees and high land of Denman and Hornby islands.

Buoys and beacons.—A beacon, showing 16 feet above high water, stands in a depth of 18 feet at the northern extreme of Maple point bank; this beacon consists of three piles, surmounted by two circular white discs, one showing to seaward, the other towards the channel abreast the beacon. The red nun buoy R.B. No. 1 marking the western extreme of Reef Bluff reef, Denman island, is moored in a depth of 6 fathoms, and a red nun buoy R.B. No. 2 is moored in 8 fathoms off the west spit of Reef Bluff. A beacon, exactly similar

in form and colour to the Maple point beacon before described, is erected in a depth of 12 feet at the edge of the shoal ground off Base flat. A red spar buoy is moored in a depth of 21 feet at the extreme of the reef off Village point, Denman island.

A beacon, showing 10 feet above high water, stands in a depth of 18 feet, at the extremity of Union spit, $4\frac{1}{2}$ miles north-westward of Base flat: this beacon consists of a single pile, surmounted by a black circular disc. A beacon, showing 12 feet above high water, consisting of a single pile surmounted by a black ball of open lattice work, is in $2\frac{1}{2}$ fathoms on the eastern edge of Grassy point bank. On the south-western edge of Goose spit stands a pyramidal beacon, surmounted by a triangle, and 32 feet high; the base is coloured black and the top yellow.

The passage across Kelp bar, between White spit and White bluff, is marked by two red beacons in $3\frac{1}{2}$ fathoms, bearing from each other N. by E. $\frac{1}{2}$ E. and S. by W. $\frac{1}{2}$ W. distant 1,600 feet apart; each beacon is a single pile, with a small lattice work triangle on the head 9 feet above high water. The marks for crossing the bar are two white-washed planks, each nailed diagonally to a tree; when in line, S. by W. $\frac{1}{2}$ W., they form a St. Andrew cross and lead over the bar in 12 feet, a little south-eastward of the beacons.

Maple point, which forms the western entrance point, is also very conspicuous; it lies $1\frac{1}{2}$ miles S.W. by W. from Yellow island, and is low and covered with maples, which in form and foliage bear a remarkable contrast to the pine, the prevailing feature, particularly in autumn and winter, when the leaf assumes a bright yellow or orange colour.

A sand-spit, which dries at low water, and is rather steep-to, extends one-third of a mile North from Maple point, and the 3-fathoms line is the same distance from the shore as far eastward as Qualicum bay; therefore, neither the coast nor the point should be approached within that distance.

If desired, there is good anchorage outside, in 6 fathoms, with Yellow island in line with Norris reef bearing N.E. $\frac{1}{2}$ N., and Maple point W.S.W. distant three-quarters of a mile.

Directions.—Entering Baynes sound by the south-eastern channel, some care is necessary to avoid a shoal sand-spit extending off Maple point on the south side, marked by a beacon. To clear

Maple bank Yellow island light should not be brought to bear northward of E. by N. $\frac{1}{2}$ N.; and when passing Hornby island, the light bearing S.W. leads clear of the reefs southward and eastward of that island.

Immediately opposite on Denman island, N.W. from Maple point, is Reef bluff, a high clay cliff, with a bare grassy slope; off this cliff, for 2 cables, extend some rocky patches (Kelp reef), marked by a red spar buoy, which narrows the width of the entrance between them and Maple point spit to something over 3 cables. When entering, it is recommended to steer in nearly mid-channel, or with the low extreme of Reef bluff in line with the low part of Ship point of Fanny bay bearing W. $\frac{1}{2}$ N., until Maple point bears South, or Mount Tremeton is in line with, or just shut in by Boyle point, the south-east extreme of Denman island bearing E.N.E., then steer W.S.W., keeping these marks on astern, which will lead midway between Maple point spit and the patches off the north shore.

Mount Tremeton, the summit of Lasqueti island, is a very remarkable bare, castellated knob, 1,056 feet high. When Maple point bears E. by S., the first reach of the sound will be well open, and Base flat, a low grassy point on the west side of Fanny bay, will be seen open of Ship point; then steer up mid-channel about W.N.W. Ship point, with the land one mile east of it, shows as two bold wooded bluffs, which should not be approached within 2 cables.

The southern side of the sound between Maple point and Fanny bay for about 4 miles is low, and shoal water extends for a considerable distance off it; it is recommended not to stand so far over on this side as altogether to shut in Base flat by the bluffs of Ship point just mentioned.

Deep bay.—Maple point from the extremity of the trees turns W.S.W. for half a mile, and forms a low sandy spit; westward of this is Deep bay, in which the depth varies from 15 to 20 fathoms, irregular bottom, but sandy. It is a small and not very desirable anchorage, and as the shoal extends off the back of the spit for its whole length to the distance of one-third of a mile, the extreme of it, which is steep-to, cannot be steered for until it bears S.E.; if intending to anchor, the best berth is in 14 to 16 fathoms about $1\frac{1}{2}$ cables East of the spit, and near the centre of the bay.

Anchorage in $10\frac{1}{2}$ fathoms will also be found by shutting out Yellow island lighthouse by the clump next to the main body of trees on Maple point.

Fanny bay, on the southern side of the sound, 4 miles north-west from Maple point, affords a good though somewhat limited anchorage. Base flat, the delta of a considerable stream, having its rise in the Beaufort range of mountains, forms its western point ; and Ship point, a bold wooden bluff, its eastern. Entering from the eastward, give Ship point, and the coast of the peninsula immediately eastward of it, a berth of a quarter of a mile.

Anchor in 12 or 13 fathoms in the middle of the bay, with Ship point distant a short half mile and in line with the Reef bluff, bearing E. $\frac{1}{2}$ S., which latter will appear as the south-east extreme of Denman island.

The eastern part of the bay dries entirely at low water, and a sandy flat extends a considerable distance off around the shores, therefore some caution is necessary in anchoring. Small vessels may stand in to 8 fathoms, from which depth it shoals very suddenly off Base flat ; a sand-bank dries for more than 3 cables at low water.

Village point, on Denman island, with a large native settlement on it, is remarkable ; it is 2 miles N.W. from Fanny bay, and a sand-spit extends a short distance off it ; northward of the sandspit is a good anchorage in 10 fathoms, known as Vachie. Care must be taken to avoid the reef, off the sandspit : it is marked by a red spar buoy.

Union wharf and anchorage on the western side of the sound, 11 miles above Yellow island, has facilities for loading with coal two vessels at a time. The southern arm of the wharf extends into 6 fathoms ; the head of the northern arm, known as the Cargo jetty, is in 4 fathoms. The wharves are connected by railway with the Union mine ; the output is about 600 tons a day. A mooring buoy lies one cable off the wharves.

There is good anchorage, in 10 or 11 fathoms, mud, off the southern end of the wharf. A limited supply of beef, vegetables, and bread, may be obtained here and at port Augusta.

Henry bay.—Denman island, towards its north-west end, falls away into a remarkable wedge shape, terminating in a singular sharp beak-shaped extreme, called Beak point ; the hollow of this beak, on the north-west side of the island, forms Henry bay, which is nearly 6 miles from Fanny bay, and is a safe and convenient anchorage, though, like the latter, it is somewhat limited in size. The shores

are moderately high and wooded; its western extreme is a low but steep shingle spit, with one or two trees on it, and a clear beach of the same character extends all around the bay.

The holding ground is very good, and the anchorage in 9 or 10 fathoms in the centre of the bay, with the western shingle point bearing N.W., when a remarkable clump of trees on Sandy island will be just open westward of it; here a vessel will be a quarter of a mile from the beach, where a considerable native village is built. The Indians resort to this bay in large numbers during summer to fish.

Sandy island.—From Beak point a series of sand-banks, some of them above water, others covered, extend in a N.W. direction for a little more than 2 miles. Sandy island, the largest of them, is two-thirds of a mile from the point, and 6 feet above high water, with large boulder stones dispersed over it: there is a good boat passage through at half tide.

White spit.—Two-thirds of a mile north-west from Sandy island is White spit, which almost covers, and is very remarkable from the number of clam shells collected on it, giving it an appearance of a white sandy beach; it is connected with Sandy island at very low tides.

Kelp bar.—The end of the shoal, which occasionally dries in patches, extends two-thirds of a mile north-west from White spit, and from it commences the remarkable Kelp bar, or bridge before mentioned (page 201), which connects Denman island with the land about cape Lazo, distant nearly 2 miles. The bar is composed of sand, interspersed with large boulders, which can be seen at low water; great quantities of kelp grow on it during summer, and it is rarely entirely without it. It is narrow in the centre—not above 3 cables—and with a depth of 15 feet at low water. The western edge of this bar is steep, shoaling suddenly, and vessels working to the N.W. through Baynes sound should not stand so far eastward as to shut in a remarkable single tree on the shingle spit of Beak point behind the clump of trees on Sandy island, or avoid bringing White bluff (which is $2\frac{1}{2}$ miles southward from cape Lazo and is very conspicuous) westward of N.W., and when within one mile of it, westward of N.N.W.

To cross the Kelp bar over its narrowest part and in the deepest water, stand $2\frac{1}{2}$ miles through the sound, north-westward from Henry bay, until the leading marks on the remarkable white beach (on the western shore, 3 miles West from Beak point) are in line bearing S. by W. $\frac{1}{2}$ W. (*see* page 201), then steer out boldly N. by E. $\frac{1}{2}$ E., or on a direct course from one beacon to the other; two or three casts of 15 feet will be struck at low water, but it will immediately deepen to 3, 4, and shortly 15 fathoms. The white beach may be distinctly seen at 3 or 4 miles distant, but when entering, until it is clearly made out, and the beacons on the bar are visible (*see* page 201), cape Lazo should not be brought northward of N.N.W., nor the clump of trees on Sandy island eastward of S.S.E.

PORT AUGUSTA, in the north-west corner of Baynes sound, although appearing to be a large sheet of water at high tide, has its upper part entirely filled up by a mud flat, which almost dries at low tides, and is formed by Courtenay river, which flows into it.*

The settlement Comox has a wooden pier on the north shore with a depth of 18 feet alongside the end, and at about one mile off, is a Hudson's bay store and an Indian village. Some English and Scotch farmers are settled in the neighbourhood.

Oil wells have recently been discovered in the vicinity of port Augusta.

Caution.—Some local magnetic disturbance has been observed here, about $2\frac{1}{2}^{\circ}$ in excess of the variation, but it does not appear to extend beyond the port.

Goose spit, a remarkable elbow-shaped tongue of land, projects to the southward and westward from White bluff; it is grassy, with one or two hillocks, and bare of trees, with the exception of two solitary small clumps. Goose spit forms the northern entrance point of the port, and is marked by a beacon 32 feet high.

Grassy point, the southern entrance point, is very low and swampy, the delta of a considerable stream; off it, at low water, sand and boulders dry for 2 cables, and the water shoals suddenly from 10 to one fathom at the distance of 4 cables, leaving a width of less than one mile between the entrance points. For beacon *see* page 201.

Directions.—Goose spit is steep-to at its western end, but shoal water extends 3 cables off its southern face; and if working in, the low western extreme must not be brought southward of West. Steer

* *See* plan of port Augusta on Admiralty chart, No. 585: scale, $m = 3$ inches.

in West, passing a quarter of a mile from the spit, and anchoring in 13 or 14 fathoms, mud bottom, when it bears N.E. distant 3 or 4 cables. A little more than half a mile westward from the spit the water shoals suddenly from 7 fathoms to a few feet.

Rounding the spit end, which may be done very close, a deep cove extends one mile to the eastward, or close up to White bluff; its upper half dries at low water, but there is snug anchorage in its outer part, in 14 fathoms, with the spit end bearing S.E. by S., distant 2 cables. This is an excellent place during a S.E. gale, though no sea to speak of could get up in any part of port Augusta.

Tides.—It is high water, full and change, in port Augusta, at 5h. 0m.; springs rise 12 feet.

Courtenay river is a deep and rapid mountain stream, but, on account of falls and other obstructions, is only navigable for a few miles for boats and canoes; it has its rise in mount Washington, from whence it flows in an E.S.E. direction, having a considerable extent of rich grass country on either side, lightly timbered with maple and pine, and in some parts entirely clear. The river is full of salmon and trout at the summer season; the river is bridged over.

Mount Washington is remarkable, and rises to 5,415 feet; it is the westernmost of a range 10 miles in length, terminating in mount Beecher to the east; to the southward and westward of it are several high mountain ranges and peaks from 4,000 to 7,000 feet above the sea, the highest being covered with snow all the year round. Between the former and the Beaufort range to the south-east is Bedford valley, through which flows the Puntluch, a stream falling into the Courtenay 2 or 3 miles above the head of port Augusta.

The Beaufort range rises on the western side of Baynes sound, 7 or 8 miles from the coast, and stretches 12 miles in a W.N.W. and E.S.E. direction, varying in elevation from 4,500 to 5,400 feet: they are very remarkable, presenting 7 or 8 distinct peaks, which are rarely free from snow.

This range, together with mount Washington, form the eastern boundary of the great central valley and chain of lakes which extend through the length of Vancouver island from the head of Barclay sound.

LAMBERT CHANNEL, between Denman and Hornby islands, is a safe passage 6 miles in length in a W.N.W. and N.W. direction. It is one mile wide at its southern entrance, gradually increasing to the north-west as it opens into Georgia strait: the general depth is from 25 to 30 fathoms, shoaling to 16 on either side within 2 cables of the shore.

The eastern side of Lambert channel, between Norman point and Shingle spit, a distance of 2 miles, has two groups of rocks which cover at high water extending nearly 2 cables off, and the shore should not be approached within a quarter of a mile; on these rocks the sea generally breaks when there is any wind, and they are marked by kelp in summer.

Norris rock, on the eastern side, is of considerable extent at low tide, but at high, a mere patch 6 feet above water; it lies $1\frac{1}{2}$ miles N.E. $\frac{1}{2}$ N. from Yellow island, and three-quarters of a mile E. $\frac{1}{2}$ S. from Norman point, the eastern entrance point of the channel: from the latter point some reefs and foul ground extend nearly 4 cables towards Norris rock, leaving a narrow passage of 8 fathoms pretty close to the latter, but it is not recommended.

Shingle spit is a remarkable low point on the eastern side of the channel, 2 miles W. by N. $\frac{1}{2}$ N., from Norman point; shoal water extends off its extreme, which should be given a berth of one cable; temporary anchorage will be found on either side of it, according to the wind; to the northward, in 13 fathoms, at less than 2 cables from the shore; to the southward, in 9 or 10 fathoms; but one patch of the rocks which cover, before mentioned, lies 4 cables E.S.E. from the spit end. On the western side, there is anchorage.

Komas bluff is a bold wooded headland, the north-east point of Denman island, from whence the coast trends westward and terminates at 3 miles in Beak point. This stretch of land is shelving, with kelp patches and shallow water extending some distance off, and should be given a berth of half a mile: indeed, after passing Komas bluff, a good limit in standing westward is Shingle spit of Hornby island in line with the south-east point of Denman island bearing S.E. $\frac{1}{2}$ E.; it is better not to stand so far westward as to open out the channel between these two points, in order to avoid the shoal ground in the neighbourhood of Sandy island and the eastern side of Kelp bar; these marks are very prominent, and answer equally for those bound through Lambert channel from the northward.

Off the north end of Hornby island is a remarkable boulder rock, 7 or 8 feet high, with smaller ones near it; do not approach the shore in this neighbourhood within a long half a mile, at which distance are depths of from 7 to 10 fathoms.

Tribune bay, on the south-east side of Hornby island, affords good anchorage with all but easterly or south-easterly winds, to which it is exposed. It is easy to enter or to leave, and conveniently situated as a stopping place for vessels bound either way, being 35 miles west of Nanaimo, and 40 eastward of cape Mudge and the entrance of Discovery passage.*

The eastern end of Hornby island terminates in a rather remarkable point (St. John), grassy, and bare of trees. Off it, in an E.S.E. direction, are 2 or 3 small low islets. Some reefs on which the sea generally breaks extend nearly half a mile outside the islets; these should be given a wide berth, and it is not recommended to pass nearer than half a mile to the north-east coast of Hornby island. The entrance of Tribune bay is one mile west of St. John point; its eastern shores are bold and cliffy, its western low and shelving, with shallow water, and reefs extending a considerable distance off them.

Nash bank, the outermost of these dangers, is a one-fathom rocky patch, which must be carefully avoided. It extends nearly one mile E. by S. from Dunlop point. There is no passage between it and Dunlop point.

Norris rock kept in line with Yellow island, bearing S.W. $\frac{1}{2}$ S., leads 3 cables south of it, in 14 fathoms; and when the centre of the white sandy beach at the head of the bay bears W.N.W., steer in for it, which will lead the same distance east of the reef. Yellow island just open south of Norris rock, bearing S.W. $\frac{1}{2}$ S., leads half a mile south of the reefs off St. John point.

With a leading wind it is recommended to pass the eastern side of the bay within a short half mile, and to steer for the white sandy beach as soon as it is open, anchoring with the eastern bluff of the bay bearing E. by N. $\frac{1}{2}$ N., 3 or 4 cables from the eastern shore, in 9 fathoms, sandy bottom; this berth will enable vessels to leave conveniently on the approach of a S.E. wind, which they should always do. There is anchorage, if desired, in 4 fathoms, much closer in.

CAPE LAZO bears W.N.W., distant 15 miles from the eastern end of Hornby. It is a remarkable salient point about 250 feet

* See plan of Tribune bay on Admiralty chart, No. 580; scale, $m = 20$ inches.

high, flat and grassy on its summit, but wooded behind, and falling abruptly to the sea in yellow clay cliffs. Although a bold-looking headland, shoal water extends a considerable distance off, and it is recommended not to approach its eastern and south-east sides nearer than 2 miles, as only $4\frac{1}{2}$ fathoms uneven bottom is found at the distance of $1\frac{1}{2}$ miles. Large boulder stones dry off for half a mile at low water.

OYSTER BAY.—From cape Lazo the coast trends W.N.W., is moderately high, and slightly indented with boulder beaches, which makes boat landing attended with danger unless it is very calm weather. At the distance of 15 miles is Kuhushan point, the southern extreme of a large but not very deep indentation named Oyster bay; it is a very low extreme. The trees, which might in thick weather be taken for the outer part of the point, begin 300 yards within it. Shelter point, nearly 4 miles N.W. by W. $\frac{1}{2}$ W. from Kuhushan, is its northern extreme.

A reef, which affords considerable protection from N.W. winds, extends half a mile eastward from Shelter point. The entrance to Discovery passage is 4 miles north-westward from Oyster bay.

Anchorage.—There is fair anchorage in 10 or 12 fathoms in this bay for those waiting wind or tide. A good berth is a little more than half a mile from the shore with Mitlenatch island bearing N.E. $\frac{1}{2}$ E., and the highest part of cape Mudge just open of the low extreme of Shelter point bearing N.W. by N.

CAPE MUDGE is one of those peculiar headlands so frequently met with on this coast, and resembles Roberts point and cape Lazo, except that the yellow clay cliff which forms its face is more covered with vegetation. The cape is between 200 and 300 feet high, flat, and wooded on its summit, falling to the westward as it enters Discovery passage with a low boulder point; the high land of Valdes island appears behind it from the south-eastward.

A boulder beach extends from it eastward, and at 2 miles in this direction the depth is not more than 5 fathoms. The edge of this shoal is fringed with kelp during summer, and is generally well defined by a tidal line, and sometimes heavy tide rips, which it is recommended not to stand into. Between cape Mudge and Willow point the tide rips at flood are dangerous to small craft in blowing

weather. The western low part of cape Mudge should not be brought to bear westward of W.N.W. when entering or leaving Discovery passage.

Cape Mudge is situated in latitude $49^{\circ} 59' 35''$ N., longitude $125^{\circ} 13' 0''$ W.

Tidal stream.—The first of the flood stream sets strongly to the eastward, over the shoal ground south-eastward of cape Mudge.

Sisters islets are two small black rocks 17 feet above high water, S.W. by S. from the west point of Lasqueti, with Stevens passage, a deep-water channel over one mile wide between them and Flat islands. The Sisters should not be approached too close in calm or light winds, as the tide sets straight past them.

A black pyramidal beacon, 42 feet high, is erected on the eastern, and largest of the three islets forming the group.

Gillies bay, $10\frac{1}{2}$ miles N. $\frac{1}{4}$ W. from St. John point, and 2 miles north-west from the Mouatt islets, a small group, which lie nearly one mile from the shore, is easily recognised by a remarkable white patch on its northern point, which is seen for many miles, and shows as two distinct white spots. An anchor may be dropped at a quarter of a mile from the beach in 12 fathoms, but it is only a stopping place.

Caution.—When standing westward towards the Denman island shore Lambert channel should not be opened out between the south-east end of the island and Shingle spit, nor should cape Lazo be approached nearer than 2 miles.

NORTHERN SHORE OF THE STRAIT OF GEORGIA.

HOWE SOUND, immediately adjoining Burrard inlet (page 179) on the north, is an extensive sheet of water, the general depth being very great, while there are but few anchorages. It is almost entirely hemmed in by rugged and precipitous mountains rising abruptly from the water's edge to elevations of from 4,000 to 6,000 feet; there is no available land for the settler, and although a river of considerable size, the Squawmisht, navigable for boats, flows into its head, it leads by no useful or even practicable route into the interior of the country.*

* See Admiralty charts :—Strait of Georgia, sheet 1, No. 579; scale, $m = 0.5$ of an inch; also sheet 2, No. 580; scale, $m = 0.5$ of an inch.

The entrance is between Atkinson point (*see* page 179), the north point of Burrard inlet, and Gower point, nearly 12 miles apart. The sound penetrates the continent in a northerly direction for 20 miles, and although of such considerable width for nearly 12 miles of its length, yet it is choked by some large and numerous smaller islands, between which are several ship passages.

Bowen island, the largest and easternmost, lying at the entrance, is remarkable, mount Gardner, rising to 2,479 feet, being round, smooth, and partially bare, unmistakably pointing out the entrance from any direction; the island is 7 miles in length in a northerly direction, and more than 3 miles in width.

Queen Charlotte channel, the easternmost passage into Howe sound, is between Bowen island and Atkinson point; Passage island, only half a mile long, but very prominent from the southward, stands in the centre of the channel, and on both sides of it is a deep-water passage; that to the west, $1\frac{1}{2}$ miles in width, is the better. A tide-rip is frequently met with off Atkinson point caused by the meeting of the ebb streams from the sound and Burrard inlet.

Snug cove.—At $1\frac{1}{4}$ miles northward of Passage island, and on the eastern shore, is White Cliff point, and opposite, on the Bowen island coast, distant $1\frac{1}{2}$ miles, is a double-headed cove. Snug cove, the southern of these, though narrow, affords excellent anchorage to small craft in 9 fathoms, sheltered from all winds.

Deep cove, the northern, is larger, but with a S.E. wind, when anchorage would be most required, a swell would set in. After passing White Cliff point the width of the channel increases to $2\frac{1}{2}$ miles, and 3 miles to the northward is Bowyer island.

White rock is a small but remarkable islet 36 feet high; some rocks which cover at high water extend a quarter of a mile N.N.W. and S.S.E. from it.

Centre island lies midway between it and the south point of Anvil island.

Directions.—If bound to port Graves, which is the principal anchorage in the sound, pass westward of Bowyer island between it and Hood point. From Hood point, Hope point bears W. $\frac{1}{2}$ S. distant 3 miles, and after rounding it, a North course leads into the harbour.

Bound up the sound by Queen Charlotte channel, a N.N.W. course leads in mid-channel ; pass eastward of White rock, Centre island, and Anvil island, through Montagu channel.

Anvil island is 3 miles long, and the summit, Leading peak, 2,746 feet high, is very remarkable, resembling the horn of an anvil pointed upwards. From almost all parts of Georgia strait this peak appears as a most prominent object.

Anchorage.—The sound carries its depth to the head, and shoals from 100 fathoms suddenly to 2 fathoms ; the latter depth is close to the mud at the head of the sound, which is so soft, that supposing a vessel to anchor, she would be certain to drag on shore with any wind up the sound.

Anchorage may be obtained off a waterfall on the eastern side of the sound in 20 fathoms, about 2 cables from the shore and one mile from the entrance of the Squawmisht river, with Watts inner point bearing S.W. by S.

Collingwood channel is the most direct route to port Graves. At the entrance both shores are steep and bold ; the channel takes a northerly direction, and is for 4 miles about one mile wide, the general depth varying from 50 to 100 fathoms.

A rock which dries 2 feet at very low spring tides lies $1\frac{1}{2}$ miles S.S.W. from Hutt island.

Worlcombe island is the outermost of the small islands, half a mile long, east and west, and very narrow. Passage rock lies almost midway between Worlcombe and Pasley islands, and covers at half-tide, it lies $3\frac{1}{2}$ cables W.N.W. from the eastern point of Worlcombe island, and when working in or out, do not stand westward, between Worlcombe and Pasley islands, as to shut in the western points of White and Ragged islands behind the low east point of Pasley island. Keats island is 3 miles long, moderately high, with a bare cliffy summit near its centre.

Bardfleur passage, westward of the central group of small islands, is a safe ship channel. Working in, it is better not to approach nearer than a quarter of a mile to Popham island, and the two smaller ones north of it. The passages between the small islands are not recommended.

A rock, on which the sea breaks at low water, lies $1\frac{1}{2}$ cables North from the north point of Popham island.

Shoal channel, the westernmost entrance to Howe sound, is convenient for those coming from the westward, and leads to Plumper cove, a snug anchorage on the north-west side of Keats island.*

The south point of Keats island, which forms the eastern point of entrance to the channel, has, lying close off it, Home island, a small but prominent and thickly-wooded island. From a short distance northward from this island a bar of sand and shingle extends quite across the channel to the steep cliffs of the mainland; the depth of water on it varies from 7 to 18 feet. When entering, keep rather over to the mainland side about 2 cables from it.

Observation point in line with the north end of South Shelter island, or just showing to the westward of it, bearing N.N.E. $\frac{1}{4}$ E., leads over the bar in $2\frac{1}{4}$ fathoms; but vessels drawing more than 8 feet are recommended not to attempt Shoal channel at low water.

Two rocks, both drying 3 feet at low water springs, and lying N. by W. $\frac{1}{4}$ W. and S. by E. $\frac{1}{4}$ E., distant nearly one cable from each other, lie near Steep bluff.

•From the northern rock the summit of Stony hill, Keats island, bears E.N.E., distant $1\frac{3}{10}$ miles; centre of Home island S.S.E. $\frac{1}{2}$ E.; and extremity of wharf at Gibson's landing W. $\frac{1}{4}$ N., distant $2\frac{9}{10}$ cables.

Pending the construction of a beacon, a small spar buoy has been placed to mark the outer rock, which dries 3 feet, and is situated $2\frac{1}{4}$ cables eastward of Gibson's landing.

A rocky spit extends from the shore under conspicuous cone, from the extreme Shelter island summit bears S.E. $\frac{1}{4}$ S. distant 8 cables, and the outer end of the pier at Gibson's landing S.S.W. $\frac{1}{4}$ W.

Plumper cove.—Immediately after crossing the bar of Shoal channel the water deepens to 20 fathoms, and two small islets, partially wooded, and almost joined at low water, will be seen one mile N.N.E.; between them and the shore of Keats island is Plumper cove, which is perfectly sheltered from all winds, as, however hard it may be blowing outside, it is generally a calm here. If wishing to enter, pass round the north end of the islets.*

Anchor in 8 fathoms in the centre of the cove. There is room to lie at single anchor, but it is recommended to moor, dropping the outer anchor in 10 fathoms when the north end of the islets bear

* See plan of Shoal channel and Plumper cove on Admiralty chart, No. 585; scale $m = 3$ inches.

West, and running up the centre of the cove, drop the inner one in 6 fathoms ; there is only room for one large vessel, but several small ones could find shelter. Thornborough channel is a continuation of Shoal channel, and leads up the western side of the sound, between Gambier island and the main.

It is high water, full and change, in Plumper cove at noon ; springs rise 12 feet.

Port Graves, the easternmost of the three bays on the south side of Gambier island, is the principal anchorage in Howe sound. It is about 8 miles from the entrance, and may be reached with great facility by either of the channels already described ; its entrance will not, however, be very apparent to a stranger until closing Hope point.*

Hutt island, scarcely half a mile long, but very high and remarkable, lies close off the north-west side of Bowen island, and is a good guide to the port when entering by either of the western channels ; from it Hope point bears N. by W., distant $1\frac{1}{2}$ miles ; keep the Hope point shore aboard on the starboard hand.

Directions.—On the western shore, three-quarters of a mile inside the entrance, a shingle spit extends out for a short distance, which should be given a berth, as shoal water extends half a cable off it ; when past this spit there is anchorage anywhere in 10 fathoms, but half a mile or more inside it, in 7 fathoms, is the best berth. When entering by Shoal channel, and bound for port Graves, after passing Plumper cove steer N.E. until near Hope point, and see the harbour open, in order not to mistake either of the western bays for it.

It is high water, full and change, in port Graves at noon ; springs rise 12 feet.

The COAST from Gower point trends W. $\frac{1}{2}$ S. for 18 miles to the entrance of Malaspina strait. White islet, a bare rock 51 feet high, lies $1\frac{1}{2}$ miles from the shore, 6 miles westward from Gower point, and is remarkable, always showing very white.

Rock point.—The point next westward of Gower point is named Rock point ; a boulder reef extends half a mile from the shore just eastward of the point.

Trail bay.—At $\frac{1}{2}$ miles N.W. from White islet is Trail bay. There is a very marked drop in the land at the head of this bay, across

* See plan of Port Graves on Admiralty chart, No. 585 : scale, $m = 3$ inches.

which, by a portage of half a mile, the natives carry their canoes into Seechelt arm, one of the many arms of Jervis inlet.

Anchorage may be obtained off the village in Trail bay, abreast a bluff in the north-east corner, in about 15 fathoms. The Indians (Seechelt) are under the care of the R.C. mission, and their chapel is a conspicuous object from seaward.

Trail islets, four in number, lie a little more than half a mile off the western end of this bay, and if necessary small vessels may drop an anchor inside them in 12 or 13 fathoms. There is a rock which dries at low water N.W. from the western Trail island 2 cables off the mainland coast.

TEXADA ISLAND is 27 miles in length, with an average width of 4 miles. Throughout its whole length stretches a ridge of rugged trap mountains, wooded generally to the summit; at the southern end mount Shepherd reaches a height of 2,906 feet; towards the northern end the range decreases in elevation, but there is scarcely an acre of land fit for cultivation throughout the island. Its shores are steep and bold on all sides, and the land rises abruptly, except at the north extreme, good limestone is found at the north end of the island.

Gilles bay, the only anchorage, and that merely a stopping place, is on the south-west side.

Upwood point, the south extreme of Texada island, is rugged and precipitous; stunted pines grow between the crevices of the bare trap rock; the land behind is more thickly wooded. Almost immediately over it rises mount Dick, a very remarkable hump-shaped hill, 1,136 feet high. A rock which covers lies 2 cables off the point.

LASQUETI ISLAND is 9 miles long, with an average width of over 2 miles; mount Tremeton is a singular turret-shaped summit, 1,056 feet high, rising nearly in its centre. On its southern side are several boat coves.

Tucker bay, on the north side of Lasqueti, is a very fair anchorage. Entering from the westward, it will be readily known by a group of small wooded islands which form its eastern side; its western point is sloping, somewhat remarkable, and partially bare of trees. The water shoals rather suddenly from 30 to 16 fathoms.*

* See plan of Tucker bay on Admiralty chart, No. 579; scale, $m = 3$ inches.

The anchorage is in 14 fathoms, with the outermost and westernmost of the small islands bearing N.N.E. and the west point of the bay W. by N. $\frac{1}{2}$ N., which will be within a quarter of a mile of the shore. With a strong N.W. wind and flood tide, the bay, though safe, would not be a comfortable anchorage; from the eastward, sailing-vessels would find some difficulty in reaching it in consequence of the prevailing N.W. winds and the narrowness of the channel at that end.

Small vessels may anchor in the south-east corner, inside the small island on the south shore in 6 or 7 fathoms, sheltered from almost any wind.

Tides.—It is high water, full and change, in Tucker bay at 7h. 30m.; springs rise 16 feet.

Sangster island, half a mile long, lies one mile S.S.W. from Young point, the eastern extreme of Lasqueti. There is a deep passage of 70 fathoms between the two, but a rocky ledge with shoal water on it extends off the western point of Sangster island.

Seal rocks, which cover at half tide, lie a little more than one mile W. $\frac{1}{2}$ N. from the western point of Sangster island, and it is not recommended to pass between the island and the rocks. Jenkins island lies 3 miles westward from Sangster, and close to the south shore of Lasqueti. Sea Egg rocks, always uncovered, lie 3 cables off the west end of Jenkins island. False bay, at 3 miles westward from Jenkins island, and the same distance N.E. by E. from the Sisters islets, is a deep bight but which is not recommended as an anchorage, though small vessels would find shelter in its north-west corner in 7 fathoms.

Stevens passage, between Sisters islets and Lasqueti, is upwards of one mile wide. Flat islands, on its eastern side, should be given a berth of a quarter of a mile, as should also Bare islands, a small group lying off the north-west end of Lasqueti.

Sabine channel, between Texada and Lasqueti islands, is a good ship passage 9 miles long, in nearly an east and west direction, with very deep water; it is 3 miles wide at the western end, but several high conical islands lying off the north-east side of Lasqueti contract the width at the eastern end, in some parts to three-quarters of a mile. There is also a narrow but deep channel, Bull passage, to the southward of these islands, by keeping close along the Lasqueti shore.

The tidal streams through Sabine channel run 2 knots an hour, the flood running westward, the ebb eastward.

MALASPINA STRAIT is a wide navigable channel, separating Texada island from the mainland. Its general direction is W.N.W. for 30 miles, when it again enters Georgia strait between Marshall point and Harwood island; its southern entrance lies between Upwood point and the western of the Thormanby islands, and is 4 miles in width. The Texada shore is bold, and almost straight for its whole length, fronted by narrow shingle or boulder beaches.

Thormanby islands, two in number, about 500 feet high, almost joined, and upwards of 2 miles in extent, form the south-east entrance point of Malaspina strait. Lying close to the mainland, these islands appear as part of it, terminating at their north-west point in a steep clay cliff, off which, at low water, dries a boulder point. Shoal water extends from this point north-west for about 4 cables, and a bank with not more than 5 fathoms on it borders the northern side of the western island for 3 cables to one mile.

From the north point of the eastern island, Tattenham ledge extends half a mile north-west; this ledge uncovers at the inner part, and has 4 fathoms water on the outer.

Welcome pass, separating Thormanby islands from the main, is a deep but narrow channel, about one mile in length, and as sunken rocks exist in its east entrance, it should be used with great caution. A rock, which dries 9 feet at low spring tide, lies with Bare islet bearing S. 46° W., 5 cables; there is deep water between the rock and Thormanby island. Another rock, which shows only at very low tides, lies near mid-channel, with Gowlland point bearing N. 59° W., distant $1\frac{1}{10}$ miles, eastward of the rock the depth is 18 fathoms.

Welcome point is the rounded point E.N.E. of Merry island; off it a shoal extends for 3 cables. A spar buoy, painted red, is moored in 6 fathoms, with north-west point of Merry island bearing S. 75° W., distant nearly $1\frac{3}{10}$ miles.

Buccaneer bay, formed by the junction of the two Thormanby islands, on their north-west side, extends in a south-east direction for over one mile, and affords good and sheltered anchorage at its head in 15 fathoms.*

Caution must be observed when entering, as shoal water extends for fully half a mile from the northern shore of both islands on both sides of the entrance. A rock, which dries at low water springs, and

*See Plan of Buccaneer bay on Admiralty chart, No. 579; scale, $m = 8$ inches.

on which the steam-vessel *Elta White* struck, lies on the south western side of Tattenham ledge, with Derby point S.E. by E. about $3\frac{1}{2}$ cables.

Tattenham ledge will be avoided by keeping the outer of the Surry islands in line with Wolf point and the centre of the beach at the head of the bay, bearing S.S.E. $\frac{3}{4}$ E.

Secret cove.—At one mile northward of the entrance to Bucca-neer bay is the entrance to Secret cove, formed between Turnagain island and the shore of the mainland. The channel in, between George point (the south-east end of Turnagain island) and Entrance island to the eastward, is half a cable wide with depths of from 7 to 11 fathoms in it. Half a cable S.W. by S. from the west end of Entrance island is a rocky patch which covers at three-quarters flood; it will be cleared by keeping White rock (2 feet high) inside the harbour on its west shore, just open of the north-west points of Entrance island, bearing N.N.E. $\frac{3}{4}$ E.

When past Entrance island, anchorage may be taken up as convenient in 7 to 9 fathoms, midway between that island and Echo island.

Rocky patch.—From Secret cove the coast, which trends north-west, is bold-to for 4 miles, at which distance a rocky patch of considerable extent lies one mile S.E. by E. from Francis point, and extends nearly the same distance parallel to the shore. The least water found on this patch was 7 fathoms, but less may probably exist.

Bargain harbour is a small harbour with depths of 5 and 6 fathoms in it. The entrance lies between the Whitestone islands (lying about 3 cables south-east from Francis point) and the islets off the shore to the eastward, the largest of which are Flat (the southern) and Green islets. By keeping in mid-channel the harbour may be safely entered.

The head of Bargain harbour communicates with Pender harbour by a narrow passage, which is available for boats at high water.

JERVIS INLET is one of the most considerable of those numerous and remarkable arms of the sea which indent the continent of America from the parallel of Juan de Fuca strait as far as lat. 60° N.; it extends by winding reaches in a northerly direction for more than 40 miles, while its width rarely exceeds $1\frac{1}{2}$ miles, and in most places is even less.

It is hemmed in on all sides by mountains of the most rugged and stupendous character, rising from its almost perpendicular shores to heights of 5,000 to 8,000 feet. The hardy pine, which flourishes where no other tree can find soil to sustain life, holds but a feeble and uncertain tenure here; and it is not uncommon to see whole mountain sides denuded by the blasts of winter, or the still more certain destruction of the avalanche which accompanies the thaw of summer.

Agamemnon channel, after running between Nelson island and the main in a general northerly direction for 9 miles, joins the main channel of the inlet; its average width is little more than half a mile, the tides run from one to 3 knots, the depth of water varies from 50 to 100 fathoms, and it affords no anchorage.

Nelson rock.—When entering by the western passage, or coming from the westward along the shore of Nelson island, avoid Nelson rock, which covers at quarter flood; it lies one mile S.W. by W. $\frac{1}{2}$ W. from Fearney point, is steep around, and unless the rock is visible it is recommended to pass outside or southward of it.

PENDER HARBOUR is the only anchorage with a moderate depth of water to be found in the neighbourhood of Jervis inlet, but its entrance is so encumbered by islands as to render it difficult of access to any but steam or coasting vessels.*

When coming from Jervis inlet by Agamemnon channel, the passage between Channel islets and Pearson island to the south-west, and Norman point to the north-east is the most convenient, but coming from any other direction it would be better to use either the one between Pearson island and Channel islets, or that between the former island and Martin island; the latter is to be preferred.

Williams and Charles islands lie immediately across the entrance, forming three channels; that to the northward between Williams island and the main (Henry point) is not one cable in width, but it is the best and has a depth of 20 fathoms.

A rock, which covers at three-quarters flood, lies more than half a cable N.N.W. from the east point of Charles island.

A pinnacle rock, with 4 to 8 fathoms close around, which dries at extreme low water, lies with the west extreme of Martin island S.S.E. $\frac{1}{4}$ E. distant $3\frac{1}{2}$ cables; and the north extreme of Pearson island W. $\frac{3}{4}$ S.

* See plan of Pender harbour on Admiralty chart. No. 585; scale, $m = 3$ inches.

Half a cable north-east of Martin island is a large rock, awash at high water. There is also a rock, which dries just after high water, on the edge of the shoal extending one-third of a cable north-west from Williams island.

Skardon islands, two in number, lie $2\frac{1}{2}$ cables eastward from Williams island; pass on either side of them and steer up the harbour, which is over a quarter of a mile in width, and the depth will soon decrease to 12 fathoms. One mile within the entrance, a peninsula extends southward from the northern shore; pass between its southern point and Mary island.

Anchorage.—Anchor in Gerrans bay, a quarter of a mile southward of the peninsula, in 6 or 7 fathoms; there is also good anchorage in Garden bay, just eastward of the peninsula, and abreast an Indian village, in 5 or 6 fathoms. The latter is the more suitable for a large ship. Pender harbour extends three-quarters of a mile above Garden bay by a very narrow passage with only 2 fathoms in it, and then opens out with a depth of 7 fathoms.

The depth in the middle of the narrow passage leading into Gunboat bay, the eastern part of the harbour, is only $1\frac{1}{2}$ fathoms. The tidal stream sets strongly through, and at low water the passage is contracted by shelving shores.

Tides.—It is high water, full and change, in Pender harbour at 6h. 0m.; springs rise 12 to 14 feet.

The western entrance to Jervis inlet is between Alexander point, the south extreme of Hardy island, on the east, and Scotch Fir point on the west. The points are not remarkable, but the opening is easily made out; it is nearly 2 miles in width, and takes for a short distance a N.N.W. direction. Scotch Fir point is rocky, and has two small islets lying close westward of it, which, like the point itself, are covered with stunted pines. Hardy island lies close to and is nearly connected with Nelson island; Blind bay between them is useless, and its entrance choked by small islands.

Rocks, with depths of 3 and 4 fathoms, are reported to lie E. by S. distant $1\frac{1}{2}$ and $2\frac{1}{2}$ miles from cape Cockburn about half a mile off shore.

Thunder bay, formed on the western side $1\frac{1}{2}$ miles above Scotch Fir point, is one of the few places in Jervis inlet where a vessel may

drop an anchor, and being near the entrance is likely to prove convenient. The bay is about half a mile deep, with a sandy beach at its head, off which 17 fathoms will be found; immediately outside it there are 30 fathoms, and the lead then drops suddenly to a great depth.

Hotham sound, a wide opening, trends, N.N.W., terminating at the distance of 7 miles in a double-headed bay; the water in every part of it is too deep for anchorage.

Nelson island, in the middle of the entrance to Jarvis inlet, is 10 miles long in a northerly direction, and about 4 or 5 miles wide; its shores are much broken and indented by several bays, in none of which, however, can anchorage be obtained in consequence of the great depth. The island is mountainous, ranging from 500 to 1,500 feet in height. Cape Cockburn, its south point, is of white granite, about 80 or 90 feet high, covered with a few dwarf pines; a rock lies one cable south from it.

Captain island, north of Nelson island, and separated from it by a narrow passage, is about one mile in extent, rocky, and steep-to.

One Tree islet, off the east side of the inlet, $1\frac{1}{4}$ miles north-east from Captain island, is small, and has a single tree on its summit, which is very conspicuous; its height is about 50 feet. A rock awash at low water lies one cable off its east side; just within it, on the east shore, is a bight where a coasting vessel may drop an anchor.

Prince of Wales reach.—Dark cove, on the west side of Jarvis inlet, within the Sydney islets, is 2 miles North from Captain island, and 12 miles from the entrance. The cove is only about 2 cables in extent, but affords a snug anchorage in 15 fathoms; a vessel of considerable size could moor within it. There is a clear deep passage one cable wide into this cove on both sides of Sydney islets.

Vancouver bay, on the east side of the inlet, 19 miles from the entrance, is about half a mile in extent. From its head, which is low, a considerable valley extends to the eastward, but the shores on both sides are craggy and precipitous, and the bay is too deep to afford anchorage, there being 60 fathoms within one cable of the bank, which extends a short distance from its head.

Princess Royal reach.—Deserted bay, also on the east side of Jarvis inlet, at the termination of Princess Royal reach, and about

37 miles from the entrance, is small, and affords an indifferent anchorage in its eastern part near the head in about 16 fathoms, exposed to west and south-westerly winds. A valley extends from the head of the bay to the north-east, through which a trail runs to the Lilloet lakes on the Fraser river, and is much frequented by the natives in the summer season.

Queens reach.—The head of Jervis inlet terminates in a patch of low swampy land through which flow some small streams, and a bank dries off about one cable; it does not afford any anchorage, there being 25 fathoms within half a cable of the outer edge of the bank. A remarkable peak, mount Victoria, rises 2 miles north of the water's edge to a height of 7,452 feet, and is a very conspicuous object on approaching the head of the inlet.

At the head of Jervis inlet there is a valley by which the Indians go to Clahoose (Desolation sound) in two days.

Princess Louisa inlet, on the east side of Jervis inlet, 5 miles below the head, is narrow, and about 4 miles long in an E.N.E. direction; it is connected by a narrow gorge to the main inlet, which at low tide becomes almost a waterfall, rendering it impossible for boats to enter except at high water; inside, like Jervis inlet, it is deep, and the mountains on both sides rise to 7,000 and 8,000 feet.

Seechelt arm, the entrance to which is on the east side of Jervis inlet, one mile north of Agamemnon channel, is an extensive arm of the sea, penetrating the land for 17 miles in a south-easterly direction. On the east side of the arm, at a distance of 7 and 11 miles from its entrance, are two smaller branches, Narrows arm and Salmon arm, extending to the north-eastward for upwards of 10 miles.

The arm at 3 miles within its entrance contracts in breadth to less than one-third of a mile, and is partially choked up with rocks and small islands, which preventing in a great measure the free ingress and egress of the tide, cause most furious and dangerous rapids, the roar of which may be heard for several miles. These rapids prevent any vessel, or even boat, from entering the arm, except for a short time after high and low water, when the tide slackens for a very limited period; it would, however, be hazardous for any vessel, except a very small one, to attempt to enter at any time, although there is a passage with from 4 to 7 fathoms between the islands and the south or peninsula shore.

The shores of the arm, except near its south part or head, are high and rocky, and in the summer season the natives catch great quantities of salmon there.

Tides and tidal streams.—It is high water at full and change in Jervis inlet at 6 hours, the rise and fall being about 14 feet; within the Seechelt arm the rise and fall seldom exceeds 6 or 7 feet.

The tidal streams are, except near the entrance of Seechelt arm, weak and irregular and influenced by winds.

HARWOOD ISLAND, off the west entrance to Malaspina strait, $1\frac{1}{2}$ miles from the continental shore and about 3 miles north-west from point Marshall, is $2\frac{1}{2}$ miles long in a northerly direction, $1\frac{1}{2}$ miles wide, from 150 to 200 feet high, flat, and thickly wooded. It is bordered by a sandy beach, and at its north point is a low grassy spit. There is deep water between the island and the shore.

Rebecca islet, lying midway between point Marshall and Harwood island, is of small extent, and 5 feet above high water.

Bare islet, one mile W.S.W. from the south end of Harwood island, is a bare, yellow, cliffy rock, about 2 cables in extent, and 30 feet above high water.

The COAST.—Westward from Jervis inlet, the north shore of Malaspina strait, takes a westerly direction for 11 miles, terminating at Grief point; for a considerable distance inland it is low, and bordered by a sandy beach.*

From Grief point the north or continental shore of Georgia strait, trends W.N.W. for nearly 20 miles almost straight to Sarah point, the south-east entrance point of Desolation sound. Throughout the whole distance the coast does not rise more than 500 or 600 feet, and is but slightly indented. There is a fresh-water stream of considerable size 4 miles West of Grief point, communicating, at about 2 miles from the shore, with a lake which extends some 40 miles northward towards the head of Toba inlet.

At one mile further westward a vessel may anchor in fine weather for night or tide at a distance of 3 or 4 cables off shore near the coast abreast Harwood island in 12 to 13 fathoms. Anchorage must be taken up with caution as flats extend a considerable distance off shore. When anchoring do not shut in the north shore of Savary island.

* See chart, No. 580.

Navigating along this coast between Grief and Sarah points, a vessel will avoid danger by keeping not more than half a mile off shore as far as Hurtado point, and passing northward of Harwood and Savary islands. When past Hurtado point, steer more westward, and pass southward or westward of the White, Double, and Powell islets.

Sliammon and Lund are settlements on the mainland, the former north-east of Harwood island, the latter, at which there is a post office, in lat. $49^{\circ} 59' N.$, long. $124^{\circ} 49' W.$

SAVARY ISLAND, nearly 6 miles W.N.W. from Harwood island and one mile from the continental shore, is 4 miles long in a W.S.W. direction, and less than one mile wide. A sandy beach with huge scattered boulders surrounds it, and extends a considerable distance off its north and west sides, which should not be approached nearer than half a mile; these boulders extend a greater distance from the south side of the island, which side, therefore, should not be closed nearer than three-quarters of a mile. The height of the island varies from 80 to 120 feet, and the south side is faced by some remarkable white sandy cliffs, very conspicuous from the south-east; its east extreme is a granite cliff, steep-to. There are several clear grassy patches on the island, but the soil is poor and sandy. A sandy bar or ledge, of one to 2 fathoms water, extends from its west point to Hernando island.

A reef extending about 5 cables W.N.W. and E.S.E., with a breadth of $2\frac{1}{2}$ cables, the boulders on which dry at low water, is reported, with the south-east extreme of Savary island about $N. 5^{\circ} E.$, distant 3 miles. The position is doubtful. All the water inside a line from Bare island towards the west point of Savary island is said to be foul.

Hurtado point, on the main abreast Savary island, is about 250 feet high, bold and cliffy. There are 37 fathoms water in mid-channel between it and the island.

Mystery rock, $2\frac{1}{2}$ miles S.E. $\frac{1}{2}$ E. from the east end of Savary island, is a patch which uncovers 4 feet at low water. From the rock shoal patches of from one to 3 fathoms extend towards the east end of Savary island. When navigating this locality observe great caution when going between Savary and Harwood islands, but by keeping within half a mile of the continental shore, and also by keeping Grief point open to the northward of the north extreme of Harwood island, this danger will be avoided.

Ragged islands, lying close to and parallel with the continental shore, are a rocky group of small islands $2\frac{1}{2}$ miles long and 3 cables wide; their south-east part is about $2\frac{1}{2}$ miles north-west from Hurtado point, and some rocks extend 4 cables from their north-west extreme.

White islet, one mile S.W. from Ragged islands, is a very remarkable, bare, white granite rock, about 70 feet high. A rock which uncovers at low water lies one cable eastward from it.

Double islets, half a mile West from the north-west part of the Ragged group, are small, and about 90 feet high, with a single tree on each of their summits.

Powell islets, one mile north-west from Double islets, are two in number, small, about 90 feet high, and covered with a few stunted bushes and trees; the westernmost islet is steep to on its north and west sides.

Sarah point, at 20 miles W.N.W. of Malaspina strait, may be called the north-west entrance point of Georgia strait. It is a rounded, rocky point, sloping gradually to the sea from a height of about 750 feet, at a short distance within it. The coast here turns sharply round to the eastward into Malaspina inlet.

Sarah point is situated in latitude $50^{\circ} 3' 40''$ N., longitude $124^{\circ} 52' 0''$ W.

Mitlenatch island lies 16 miles N.W. from cape Lazo, is half a mile in extent, 200 feet high, bare and peaked. Between it and the Vancouver island shore, distant nearly 6 miles, is the fair channel to cape Mudge and Discovery passage. Shoal water extends about half a mile northward of Mitlenatch island.

Sentry shoal, within the limits of the 10 fathoms line, extends $1\frac{1}{2}$ miles N.W. and S.E., the least depth found being 5 fathoms, from which the summit of Mitlenatch island bears N. 30° W., distant $2\frac{1}{10}$ miles.

HERNANDO ISLAND, 2 miles West from Savary island, is about 2 miles in extent, flat, thickly wooded, and from 120 to 170 feet high. A ledge composed of sand and huge boulders extends two-thirds of a mile from its south-east point, and there is only a depth of $1\frac{1}{4}$ fathoms in the channel between it and Savary island. From the west side some rocks extend off upwards of 2 cables in many places, and it should not be approached nearer than half a mile in passing.

A dangerous rock, which dries at low spring tides, lies three-quarters of a cable off Hidalgo point, and there is no passage between.

Stag bay, on the north side of Hernando, affords anchorage in 12 to 15 fathoms at a distance of about 2 cables' lengths off shore, and is useful as a stopping place for vessels bound to Bute inlet or Desolation sound. There is a small fresh-water stream in the east part of the bay.

Tongue point, the north-west extreme of Hernando and of Stag bay, is a low sharp sandy point or spit, covered with a few trees. Vessels should anchor at about three-quarters of a mile from this point, with the east part of Twins islands bearing N. by W.

Baker passage, to the northward of Hernando island and leading from the strait of Georgia to the entrance of Desolation sound, is about 3 miles long in a north-easterly direction, and one mile wide in the narrowest part, being bounded on the north side by Cortes and Twins islands.

Tides.—It is high water, full and change, in Baker passage at 6h. 0m.; springs rise 12 to 14 feet.

Twins islands, about $1\frac{1}{2}$ miles North from Hernando, are two rocky islands connected by a sandy beach at low water, covering an extent 2 miles long in a north-westerly direction, and about one mile broad. The northernmost Twin is 490 feet high, rising to an almost bare summit in the centre; the southern one is about 300 feet, and on both of them are numerous indications of iron and copper ores. None but small craft should go north of these islands. Some small islets lie a short distance off their north side.

Centre rock, which covers at a quarter flood, is in the middle of the passage between Twins and Cortes islands.

To avoid the ledge off Reef point (the south extreme of Cortes island), when entering Baker passage, bring Tongue point on a N.E. bearing, and steer for it, passing about one cable off, then keep midway between Hernando and the Twins.

Blind creek, on the east side of Cortes island, $1\frac{1}{2}$ miles North from Twins islands, is a basin of about 4 cables in extent, with from 7 to 9 fathoms water; there is, however, in the entrance, a rock which covers at a quarter flood, rendering the place useless as an anchorage.

Three islets, lying half a mile off the entrance of Blind creek, are three bare white rocks about 60 feet high, almost connected at low water; there is a depth of 27 fathoms at 2 cables eastward from them.

LEWIS CHANNEL, off the entrances to Desolation sound between Cortes and Redonda islands, runs nearly straight upwards of 12 miles N.W., and varies in breadth from one mile to 3 cables; its shores are generally rocky, low in the south part, but rising gradually to the north-west.

Turn point, the south-west entrance point of this channel and the east extreme of Cortes island, is about 100 feet high, rocky, and covered with a few stunted trees; and close in shore northward of the point are two islands forming a small boat cove.

At 6 miles from the south entrance to Lewis channel, Teakerne arm penetrates Redonda island 4 miles in an E.N.E. direction, but is too deep to afford anchorage, except for small craft near its head, and close to the south side of entrance.

Tidal streams.—In Lewis channel the streams are weak and irregular, seldom exceeding 2 knots, and are influenced by the winds.

SQUIRREL COVE, on the west side of Lewis channel, $4\frac{1}{2}$ miles from Turn point, is a small land-locked basin of 6 to 7 fathoms water, with room for a vessel of considerable size to lie at single anchor. It is entered by a narrow passage about 130 feet wide, with 5 fathoms water, on the west side of the island (Protection island) in the entrance, which protects the cove from the southward. The shores are moderately high, and though much broken, very picturesque and fertile in appearance. To the northward of, and connected at high water with the cove, is a long narrow lagoon, stretching to the north-west nearly across Cortes island.*

Squirrel cove can only be entered by steamers, or sailing-vessels with a fair wind, and the chart is the best guide.

Tide.—It is high water, full and change, in Squirrel cove at 5h. 0m.; springs rise 12 feet.

Boulder point, the south-east entrance point, is low, and may be easily known by a large boulder on its west side; a rock, which covers, lies nearly one cable south from it, but the point may be rounded at a distance of 2 cables.

Northward from Squirrel cove the west side of Lewis channel becomes more rocky, and gradually increases in height; it takes a

* See plan of Squirrel cove on Admiralty chart, No. 580; scale, $m = 3$ miles.

northerly direction for one mile to Junction point, and then trends to the north-west for 7 miles, the channel ending at Bullock bluff, the north extreme of Cortes island.

At $3\frac{1}{2}$ miles from Junction point the depths in the channel shoal to 27 and 30 fathoms, and a vessel may anchor in about 18 fathoms at one cable from the west shore. Vancouver's ships anchored here in 1792 while exploring this part of the coast.

MALASPINA INLET, $1\frac{1}{2}$ miles E.N.E. from Sarah point, penetrates the continent 8 miles in a S.E. by E. $\frac{1}{2}$ E. direction ; it has one good harbour, and several arms, at the head of some of which there is anchorage. The inlet at its entrance between Georgina point and Zephine head, the west point of Gifford peninsula, is 4 cables wide, which is its general width, until abreast Scott point on the northern side, a distance of 2 miles, when it is contracted to 2 cables ; this portion of the inlet, however, is so studded with islands and rocks as to considerably narrow the navigable channel. The depths in it vary from 30 fathoms to 6 fathoms.

At Scott point the inlet for three-quarters of a mile takes an easterly direction, and then between Hillingdon point and the north end of Coode peninsula widens out to one mile and again turns to the south-eastward for $2\frac{1}{2}$ miles, and, under the name of Okeover arm, continues in the same direction for a further distance of $2\frac{1}{2}$ miles, the width gradually decreasing to $3\frac{1}{2}$ cables. To the eastward of Coode peninsula the water becomes very deep, but at the beginning of Okeover arm it shoals to 40 fathoms, and gradually to 5 and 6 fathoms at nearly 2 cables from its head.

Freke anchorage, in 12 or 14 fathoms, is at the head of Okeover arm, about 3 cables from the edge of the flat that extends 2 cables from the head of the arm, just above Lucy rock, which lies very close to the south-western shore.

Josephine islands, about three-quarters of a mile within the entrance of Malaspina inlet, with a passage on both sides, are two in number and almost joining each other ; the north-western one is very small, the other is about $1\frac{1}{2}$ cables long in the direction of the inlet, and not more than half a cable wide. The passage between them and the south-western shore is one cable in width, and is to be preferred.

Cavendish rock, awash, and marked by kelp, lies $1\frac{1}{2}$ cables E. by N. from the south east end of Josephine islands, and is a danger that must be avoided when passing eastward of those islands.

Cross islet, distant $1\frac{1}{2}$ cables from the northern shore of the inlet, and $2\frac{3}{4}$ cables E.S.E. from Josephine islands, lies on the northern side of the channel; it is small, not more than half a cable in extent.

Rosetta rock, the principal danger in entering Malaspina inlet, is awash, and lies nearly one cable S. by W. from Cross islet.

Thorp island lies close to the southern shore of the inlet $2\frac{1}{2}$ cables S. by E. $\frac{1}{2}$ E. from Josephine islands, a rock awash lies about half a cable south-eastward from it.

Neville islet is very small and lies close to the northern shore nearly half a mile E.S.E. from cross islet.

Cochrane islands, a group of several small islets extending $3\frac{1}{2}$ cables in a north-west and south-east direction, lie 2 cables from the south shore of the inlet, and southward from Neville islet. These islands should not be approached too closely, and there is a patch with 3 fathoms on it about one cable from their western end.

Lion rock, surrounded by kelp, lies 2 cables S.E. from Selina point, the south extreme of Gifford peninsula, and 2 cables eastward of Coode peninsula.

Trevenon bay, one of the arms of Malaspina inlet and $2\frac{1}{2}$ miles from its entrance, runs S.E. by E. $\frac{1}{2}$ E. for $1\frac{1}{4}$ miles, and at its head is only separated from Penrose bay by a narrow neck of land 3 cables broad. Off the south-east extremity of Coode peninsula, distant one cable, is Boundary rock. The entrance to Trevenon bay is half a mile south-east from Scott point; the average width is less than a quarter of a mile, the depth varying from 25 fathoms to 4 fathoms at 2 cables from the head. Off the north-west entrance point of the bay lies the small island Alton, about one cable from the shore.

Lancelot arm branches off at Selina point sharply N. by W. and extends in that direction for 3 miles; its head is only divided from Portage cove (Desolation sound) by a low neck of land not much more than half a cable across, forming Gifford peninsula, rising

abruptly over Portage cove to a height of 1,000 feet, and having part of the northern shore of Malaspina inlet for its base, where it is not more than half the height. The arm maintains an average width of 6 cables until near its head, where it is only $2\frac{1}{2}$ cables wide. In the southern part of Lancelot arm the water is very deep, but at about three-quarters of a mile from Selina point until half a mile from the head the depths vary from 30 to 37 fathoms, and then shoal to 17 fathoms and gradually to 11 fathoms.

Vessels of moderate size may anchor in Wooten bay, about one cable from the head of Lancelot arm in 12 fathoms water.

Isabel bay, about $1\frac{1}{3}$ miles from Selina point, on the west shore of Lancelot arm, is about 2 cables in extent, and affords anchorage for coasters in from 10 to 12 fathoms. Mary and Polly islands lie in the entrance.

Thors cove, on the eastern shore of Lancelot arm, $1\frac{1}{2}$ miles North of Hillington point, the east entrance point of the arm, extends in an E.N.E. direction for 3 cables with from 12 to 5 fathoms. A coaster might drop an anchor in this cove in about 10 fathoms. At one cable off Sebastian point, the north entrance point of Thors cove, is Thynne island.

Theodosia arm has its entrance at about one mile from the head of Lancelot arm, and extends in a N.E. direction for $1\frac{1}{2}$ miles with a moderate depth of water and a width of 3 cables, but the entrance to it is so very narrow and choked with rocks, as to render it for all practical purposes, useless.

Grace harbour, on the northern side of Malaspina inlet, about $2\frac{1}{2}$ miles from Zephine head, has its entrance between Scott and Moss points, which are about one cable apart in an E.N.E. direction. The harbour extends about one mile N. by E. $\frac{1}{2}$ E., and is divided at the head by a jutting point into Barlands and Carberry bays. Two cables within the entrance points a small island lies nearly in the middle of the channel; there is a passage on both sides of it, but the western one is only suitable for boats. At 4 cables above the island the harbour for a short distance contracts to half a cable, and then opens to the width of $2\frac{1}{2}$ cables.

Directions.—Having entered Malaspina inlet midway between Georgina point and Zephine head, keep over towards Holland point

until the channel on the southern side of Josephine islands opens out, and then steer boldly through it with Cochrane islands nearly ahead (the course will be S.E. by E. $\frac{1}{2}$ E.). Keep the extreme of the land near Zephine head about midway between the south side of Josephine islands and the south shore, if anything rather nearer the latter, which will lead between Rosetta rock and the rock off Thorp island; when Neville islet bears E. $\frac{3}{4}$ N. steer towards it for a short distance, to avoid the 3-fathoms patch off Cochrane islands, until the north-west Cochrane island bears S.S.E., when alter course to round Scott point distant one cable and steer up the harbour mid-channel, passing eastward of the small island lying 2 cables within the entrance. A shoal patch on which, however, the least water is 4 fathoms, lies 2 cables south-east from Scott point.

The best anchorage is in about 10 fathoms, $1\frac{1}{2}$ cables northward of the small island, abreast Ka kae kae village.

Tides.—The tidal streams at the entrance of Malaspina inlet run about 2 knots. It is high water full and change at 5h. 0m.; springs rise 12 feet, and neaps 9 feet.

Kinghorn island, off the south entrance to Desolation sound, is about 2 miles in circumference, and from 400 to 500 feet high; it is cliffy and steep-to on the south-west side.

Station island, about $1\frac{1}{4}$ cables in extent and 270 feet high, lies $2\frac{1}{4}$ cables N.N.E. from the north point of Kinghorn island; two small islets lie between.

Mink island, nearly midway between Redonda island and the main, is three-quarters of a mile long, one-third of a mile wide, and 700 feet high. A short distance from its north-east end are Broken islands.

DESOLATION SOUND, between the south-east shore of the western Redonda island and Mink island, has too great a depth for anchorage. At half a mile N.E. from Mink island is Otter island, only separated from the main by a very narrow passage.

Deep bay.—Bold head, the western entrance point of Deep bay, lies one mile East from the south point of Otter island; three small islets lie S.W. by S. from it, the outer one, Grey islet, being distant 4 cables. The entrance to Deep bay is about 3 cables wide, which

width it maintains to its head, a distance of nearly one mile, with a general northerly direction.

The anchorage space is confined, but small vessels can anchor in a cove at its north-west corner in 10 fathoms. When entering from the northward pass between Otter and Broken islands and westward of Grey islet; from the westward the channel is clear.

To the northward of Otter island there are small islands lying in pairs, Morgan and Melville islands being to the southward, and Mary and Eveleigh islands to the northward. Melville and Mary are the westernmost, the former, which is 450 feet high, being the largest of the group, and the latter the smallest. At half a mile W. by N. from the south end of Morgan island there is a rock which is just awash at high water.

Prideaux haven, situated 3 miles north-eastward from Mink island in the N.E. part of Desolation sound, affords good and sheltered anchorage. The entrance between the east shore of Eveleigh island and the Oriel rocks is 85 yards wide, with a depth of 4 fathoms. The anchorage is in the western part of the haven in 7 to 9 fathoms. Melanie cove, the eastern part of the haven, is entered by a narrow channel about half a cable wide, opening out inside to one cable in width with 4 to 6 fathoms.*

It is high water, full and change, in Prideaux haven, at 5h. 0m. : springs rise 12 feet.

Homfray channel.—North-eastward from Desolation sound is Homfray channel, 15 miles in length, leading to Toba inlet, and westward through Pryce channel to Bute inlet. Homfray channel has deep water throughout.

Waddington channel, leading from Desolation sound north-westward between the two Redonda islands, is about one mile wide at its southern entrance, gradually narrowing to about one cable at its northern.

At three-quarters of a mile south of Marylebone point (the south-west entrance point of Waddington channel) there is a remarkable white patch.

Pendril sound.—At 3 miles north-west from Horace point, the south-eastern entrance point of Waddington channel, Pendril sound

* See plan of Prideaux haven on Admiralty chart, No. 580; scale, $m = 20$ inches.

branches off to the northward ; it extends 6 miles with an average width of three-quarters of a mile, and nearly divides east Redonda island into two parts ; it has no anchorage.

Walsh cove, between the Gorges islands and the western shore of Waddington channel, affords anchorage in 12 to 14 fathoms in mid-channel.†

Toba inlet extends in a general north-easterly direction for 18 miles from the northern end of Homfray channel. At its entrance lie Channel and Double islands, each 400 feet high, leaving a channel of over one mile in width between them ; the inlet is here nearly 2 miles wide, gradually narrowing to one mile wide at its head. A fair berth is in about 20 fathoms, off the flats, in the north-west corner of the head of the inlet. Care must be observed when coming to an anchor as the water shoals rapidly alongside the flats, the water being of a milky colour affords no guide as to its depth. There is a small village (Clahoose Indians) on the banks of the eastern of the two streams which flow into the head of the inlet.

SUTIL CHANNEL.—This extensive channel, which leads from the western part of Georgia strait to the entrances of Toba and Bute inlets, is bounded on the east side by Cortes, and on the west by Valdes and Read islands. It is 15 miles long in a northerly direction, and at its entrance is 6 miles wide, decreasing to one mile wide in the northern part.

There are several good anchorages on both shores, two of which, Drew harbour (on the west) and Carrington bay on the east shore of the channel, are easy of access to all vessels, and useful as stopping places.

The tidal streams in Sutil channel are weak, seldom exceeding 2 knots ; the flood stream sets to the northward from Georgia strait ; it is high water, full and change, at 6 hours, and the rise and fall is 12 feet.

CORTES ISLAND.—The west side of this island, which forms the eastern boundary of Sutil channel, is for the most part low, and indented by several bays and creeks, in many of which good anchorage may be found.

† See plan of Walsh cove on Admiralty chart, No. 580 ; scale, $m = 2\cdot0$ inches.

Reef point, its south extreme, has a ledge composed of sand, boulders extending three-quarters of a mile from it and which cover at three-quarters flood; off its outer edge are 6 fathoms. The outer extremity is marked by a red can buoy; the outer edge of the reef is just inside this buoy.

From Reef point the west coast of Cortes island trends in a northerly direction for $3\frac{1}{2}$ miles, is flat, from 80 to 150 feet high, and bordered by a sandy beach extending upwards of 2 cables off in some parts; it afterwards turns in a westerly direction, becoming rocky and broken, with a few islets a short distance off it in some places.

Manson bay is on Cortes island, eastward of Mary island. There is a post office here.

Whaleton bay, on the west coast of Cortes island, has a post office and wharf. In the middle of the entrance is a dangerous rock.

GORGE HARBOUR, the entrance to which is on the west side of Cortes island, $4\frac{1}{2}$ miles N.N.W. from Reef point, is 2 miles long in a westerly direction, and one mile broad at the widest part, affording good anchorage in 9 to 12 fathoms. The entrance to it is through a narrow gorge nearly half a mile long, bounded on both sides by steep cliffs about 200 feet high, and is less than 40 yards wide in some places, with 6 fathoms in the shoalest part; the tidal streams set through it at from 3 to 4 knots. At the inner end of the Gorge is Tide islet, 20 feet high, lying nearly in the middle of the channel; the passage is to the westward of it. There are several small islands inside the harbour, and the shores are rocky, varying in height from 100 to 300 feet.*

Guide islets, just south of the entrance, are useful in indicating it, being two small, bare, yellow-topped islets about 20 feet high, and conspicuous from the south-east. They are steep-to, and there is a clear passage on either side of them into Gorge harbour.

Bee islets, within the harbour, 3 cables north-west from the entrance, are two small bare rocks about one cable apart, and 6 feet above high water.

Brown island, in the middle of the harbour, about 3 cables N. by E. from the entrance, is nearly one mile in circumference, and thickly timbered. It is about 150 feet high, and the shores are rocky.

* See plan of Gorge harbour on Admiralty chart, No. 580, scale, $m = 3$ inches.

Ring island, at about one cable east from Brown, and 70 feet high, is wooded, but much smaller; New rock, which covers at a quarter flood, lies nearly one cable east from it, and should be avoided. There are two small islands, Stove and Pill, each 30 feet high and 3 cables apart, lying close to the shore in the northern part of the harbour. Neck islet, 20 feet high, lies off a small cove in the south-east corner of the harbour.

Anchorage.—The best and most convenient anchorage in Gorge harbour is in the west part, about half a mile from the entrance, in 12 fathoms.

There is also good anchorage between Ring island and the north-east part of the harbour in from 7 to 9 fathoms.

Directions.—Entering Gorge harbour, which can only be done in a steam-vessel, after passing Guide islets, steer boldly up the gorge or entrance, and take care, on nearing its north part, to pass between Tide islet and the west shore, the passage east of the islet being shoal, when haul to the north-west, pass on either side of the Bee islets, and anchor in from 10 to 12 fathoms, muddy bottom, one or 2 cables westward from them. Proceeding to the eastern part, after passing Tide islet, keep to the northward, and rounding the west side of Brown island at one cable distant, and passing the north side of it and Ring island, anchor midway between the latter and the north-east end of the harbour in from 7 to 10 fathoms. If requiring to water, this anchorage is more convenient; but to avoid the New rock do not go to the southward of Ring island.

Mary island, on the east side of Sutil channel about 3 miles N.W. by W. $\frac{1}{2}$ W. from Reef point, is of a round shape, about 6 miles in circumference, and from 90 to 120 feet high; its shores are bordered by a sandy beach scattered with huge boulders.

Boulder reef, extending upwards of one mile S.S.E. from its south point, is a ledge about 2 cables wide, which covers at high water.

From the north part of Mary island Shark sand-spit extends in a northerly direction to within one cable of Cortes island. There are 8 fathoms in the passage between the spit end and Cortes island. Camp island, off the west extreme of Cortes island, and 7 miles from Reef point, is of small extent, 100 to 200 feet high, and wooded. Plunger pass, between Camp and Cortes islands, is about 3 cables wide, and deep. Centre islet, two cables west from Camp island, is bare, and about 12 feet above high water.

Carrington bay, on the north-west side of Cortes, about 3 miles from Centre islet, is one mile deep in an easterly direction, about 3 cables wide, and affords anchorage at 3 cables from its head in from 7 to 11 fathoms. Along its north side are some small islets, and a rock which uncovers at low water, but if intending to anchor in the bay, keep about one cable from the south shore, which will clear all danger. At the head of the bay is a large salt-water lagoon.

Von Donop creek, the entrance of which is $5\frac{1}{2}$ miles from Centre islet, is long and narrow, penetrating Cortes island in a south-easterly direction for upwards of 3 miles. There is good anchorage in 5 to 6 fathoms near its head, but the entrance being only 30 yards wide in some places, with $3\frac{1}{2}$ fathoms in one spot, do not use it as a stopping place, for Carrington bay is much more convenient and easy of access.

VALDES ISLAND.—From cape Mudge, the south extreme of Valdes island and the south-west entrance point of Sutil channel (*see* page 209), a bank extends in a south-easterly direction for nearly 2 miles, and until well inside the channel the cape should not be approached within that distance. The coast of Valdes turns sharply round the cape N.N.W., trending in a straight direction for $5\frac{1}{2}$ miles, and bordered the whole distance by a beach extending off upwards of one cable in many parts. The land is flat, and heavily timbered, but appears very fertile.

Drew harbour, on the east side of Valdes island, 6 miles from cape Mudge, is about one mile deep, 3 to 4 cables wide, and rendered perfectly secure and land-locked by Rebecca spit, a narrow strip of land 6 to 8 feet high and open wooded, which forms its eastern boundary; its shores are low, and bordered by a sandy beach.*

The anchorage, in 9 to 15 fathoms, sandy bottom, at half a mile from its head, is the best in Sutil channel.

Heriot islet, lying north-west of the entrance, is about 250 feet high, rocky, of small extent, and separated from Valdes by a narrow boat pass. In the bay to the southward of it is fair anchorage, and fresh water may be procured; the depths, however, in the entrance to it are irregular.

If intending to anchor in Drew harbour, round the north part of Rebecca spit at a distance of about one cable, proceed up the harbour

* See plan of Drew harbour on Admiralty chart, No. 580; scale, $m = 8$ inches.

in mid-channel, and anchor at about half a mile from its head in 15 to 9 fathoms. The east side of Rebecca spit should not be approached within 2 cables.

Hyacinthe bay, on Valdes island, $1\frac{1}{2}$ miles north-west of Drew harbour, is of small extent, with some 16 to 20 fathoms water, but affords no anchorage; a small rock 4 feet above high water lies in the middle of the entrance.

Open bay, half a mile north from Hyacinthe bay, and separated from it by a rocky point, is half a mile in extent, with from 10 to 12 fathoms water; but as the bottom is rocky, and the bay open to the south-east, a vessel should not anchor there.

Breton islets, 40 feet high and extending upwards of one mile S.E. from the north part of Open bay, are small, and from the outer one, which is wooded, a reef extends 3 cables, covering at a quarter flood.

HOSKYN INLET, formed between Read and Valdes islands, is 7 miles long in a northerly direction, with an average breadth of two-thirds of a mile; the shores are broken and rocky, with some small islands off the south entrance and along the east side, and there is no anchorage within it, except for small craft. This inlet contracts at its northern end to a very narrow passage leading into Drew pass, but as it is choked with rocks and dries at low water, connecting Read and Valdes islands, the only exit is by the southern entrance.

Village bay, on the west side of this inlet, just within the entrance, is about one mile deep and one-third of a mile wide, with from 12 to 24 fathoms water, but affords no good anchorage; there is a large village at its head.

READ ISLAND, bordering the west side of the north-west part of Sutil channel, is 9 miles long in a northerly direction, and from one to 3 miles broad; its southern part is low, but rises gradually to the northward to 1,608 feet; the shores are rocky, steep-to, and much indented, especially on the east side near the middle. Viner point, its south extreme, 7 miles north from cape Mudge, is bare and about 40 feet above high water. The east side of Read island to the northward of the Penn islands is rocky.

Burdwood bay, on the east side of Read island, 2 miles from Viner point, is about one mile wide, 2 to 3 cables deep, and contains several small islets. There are 12 fathoms water at a short distance off shore, in its north and south parts, where a vessel may stop in fine weather, but the bay is open to the south and east.

Evans bay, the next inlet on the east side of Read island, to the northward of Burdwood bay, is about 3 miles long in a northerly direction, $1\frac{1}{2}$ miles wide at the entrance, and branches off in two narrow arms near its head; its shores are rocky and much broken, and there is no anchorage except in Bird cove, on the west shore, where small craft may find shelter. Frederic point, the north-east point of entrance to the bay, is bold, and may be approached to within one cable.

Hill island, just outside the entrance to Evans bay, is of small extent, but conspicuous; its summit being 490 feet high, the coast is rocky.

Penn islands, four in number, near the middle of Sutil channel, northward of Evans bay, cover an extent about $1\frac{1}{2}$ miles long and one mile wide; they are rocky, covered with stunted trees, and their greatest elevation is about 270 feet. Do not venture among them.

A rock awash lies 80 yards N. 55° E. from the north point of the eastern island.

Directions.—Entering Sutil channel from Georgia strait, pass half a mile on either side of Mitlenatch island; when past Mitlenatch island keep it on a S.E. by E. bearing, and steer N.W. by W. till the south part of Mary island bears N.E. by N.; a vessel will then be clear of the Boulder reef. Thence, steering about N.N.W. or N.W. by N., and passing about a quarter of a mile westward of Centre islet, steer up mid-channel, eastward of Penn islands.

A vessel may beat through this channel, but till past the dangers in the south part it would not be prudent to near the south-west sides of Cortes and Mary islands within $1\frac{1}{2}$ miles when standing eastward; and when standing towards cape Mudge do not approach it within 2 miles, or bring Mitlenatch to the eastward of E. by S. $\frac{1}{2}$ S., until the cape bears S.W., when a vessel may stand to within half a mile of the Valdes shore. If intending to anchor, Drew harbour and

Carrington bay are easy of access for any class of vessel, and are but little out of the regular track.

CALM CHANNEL, north of Lewis and Sutil channels, leading from them to Bute inlet, is 9 miles long in a N.W. by W. direction, and about one mile broad; its shores rise abruptly to a great height and the tidal streams are weak except in the north-west part.

Calm channel is not well adapted for any vessels except steamers as there is generally but little wind, and no anchorage.

The channels known as Hole in the Wall, and Okishollow, are not recommended, they are encumbered by rocks and rapids; small steamers, however, use them to reach the logging camp at Wyatt.

Tides.—It is high water, full and change, in Calm channel at 7h. 0m.; springs rise 14 feet. In Surge narrows at 6h., springs rise 12 feet, and the streams run from 7 to 9 knots.

Rendezvous islands, three in number, which lie on its west side near the south part, cover an extent 3 miles long in a W.N.W. direction, and about half a mile wide; the eastern island is 350 feet, the middle 300 feet, and the western 601 feet high.

Drew pass is a deep passage between the Rendezvous islands and the north part of Read island; and between the middle and easternmost islands is a small spot with from 7 to 15 fathoms water, where a small craft may anchor.

It is high water, full and change, at the Rendezvous islands at 7h. 0m.; spring rise 14 feet.

Raza island, lying at the northern entrance to Sutil channel, is 3 miles long north and south, and 2 miles wide east and west, and 3,020 feet high; a portion of its south side, which forms the northern side of Calm channel, is clifty.

North passage, on the west side of Raza island, communicates with Ramsay arm which indents the continent in a northerly direction for 7 miles and has deep water.

Deer passage, between Raza and Redonda islands, 4 miles long and $1\frac{1}{2}$ miles wide, connects Pryce channel with Sutil channel.

Stuart island, at the northern termination of Calm channel, and in the entrance of Bute inlet, is about 4 miles in extent, of an undulating surface, rising in some parts to 800 and 1,000 feet. Its

coast is rocky : and the tidal streams set strongly round its north and west sides, but there is a clear passage into Bute inlet eastward of it, nearly one mile wide, in which very little stream is felt.

BUTE INLET.—This extensive arm of the sea, which penetrates the continent for nearly 40 miles in a winding course to the northward, presents many similar features to Jarvis inlet (page 218), the general breadth varying from one to 2 miles, and the shores on both sides rising abruptly and almost precipitously in many places to stupendous mountains from 5,000 to 8,000 feet high, whose summits are generally covered with snow all the year round. At the head are two extensive valleys, one penetrating north-west and the other south-east, from which flow streams ; the one to the westward, is called by the natives Homalko river.

Off these rivers some sand-banks extend a short distance, affording indifferent anchorages near their outer edges ; but the soundings everywhere else in the inlet are very deep. The water for some distance from the head is nearly fresh, and of a milky white appearance ; in the summer months there is a constant outset, varying in strength from one to 2 knots.

Tides.—In Bute inlet it is high water at 6h. 0m., and the rise and fall varies from 12 to 14 feet.

Arran rapids, at the entrance of Bute inlet on the west side, between Stuart island and the continent, are one cable wide in the narrowest part. The streams rush through with great strength, 7 to 9 knots (the flood from the westward), and it is very hazardous for a vessel to go through.

Orford bay, on the east side of the inlet, 19 miles from the entrance, is of small extent, with 35 fathoms close to the edge of the bank, which extends from the head. A small vessel may use it as a stopping place.

Waddington harbour, at the head of the inlet, being in fact its termination, is about 2 miles in extent, and affords very indifferent anchorage off the edge of the banks, extending from the Homalko and Southgate rivers and off its east shore ; these banks are reported to frequently change. Except in the vicinity of the rivers the land rises almost precipitously to 4,000 and 5,000 feet, is most sterile and

rocky, covered with stunted pines. The best anchorage is near the north part, about half a mile off shore, in 15 fathoms, but it is exposed to the south-west, and strong winds from this quarter would make the anchorage unpleasant, if not unsafe.*

It is high water, full and change, in Waddington harbour at 6h. 0m.; springs rise 13 feet.

Homalko river enters Waddington harbour on the west side, and is a stream of considerable extent, winding to the north-west through a large valley. At the entrance is a bar with only one to 2 feet water over it at low tide, but within, the water deepens to one and 3 fathoms; the breadth varies from 50 to 200 yards, and the river is navigable for boats and small steamers several miles. The shores for 2 miles from the entrance are low and swampy, covered with willows, but further up on the western side the land rises 1 or 5 feet above high water, and appears very fertile, though heavily timbered; the opposite side is steep and rocky; in summer months the current runs 5 knots out of the river.

From the sources of the Homalko river there is a route to the gold-mining regions in the far north of British Columbia.

Directions.—To navigate Bute inlet but few directions are required; if intending to anchor in Waddington harbour, when nearing it, steer for its north part, anchoring at about three-quarters of a mile off the head in 15 fathoms, and about 3 cables from the high northern shore; the anchor should be dropped immediately 15 fathoms are obtained, as the bottom shoals rapidly.

Sailing-vessels entering or leaving the inlet should keep close to the eastern shore, or the ebb tide may take them through the Arran rapids to the westward.

CARDERO CHANNEL, communicating by Nodales channel with Discovery passage and Johnstone strait, winds in a general east and west direction for 19 miles, with an average width of one mile at the eastern part, but only half a mile in the western; its shores are generally rocky and mountainous, and the channel is studded with numerous small islands, and it is not without dangers, the water in most parts, however, being very deep.

Stuart island lies across the eastern entrance of Cardero channel, almost blocking it, but leaving narrow passages both to the north-

* See plan of Waddington harbour on Admiralty chart. No. 580; scale, m = 2 inches.

ward and southward ; the former, Arran rapids (*see* page 240), owing to its narrowness and the strength of the tide, which rushes through it at the rate of from 7 to 9 knots, is not navigable except at great risk ; the latter, half a mile wide, is also not recommended, as at its northern end the tide runs directly at right angles to a vessel's course at the rate of from 6 to 7 knots.

At $2\frac{1}{2}$ miles within the entrance Dent island causes further obstruction by contracting the channel to 3 cables, which narrow passage is full of dangerous rapids, overfalls, and whirlpools, with the probability of the existence of sunken rocks ; therefore it cannot be considered safe or prudent to enter or leave Cardero channel by its eastern entrance, and it is advised to carefully avoid that part of it which is eastward of Dent island.

A rock, which nearly dries, lies a quarter of a cable off shore, half a mile West from Johns point, and southward of Chaune island.

A sunken rock lies about a quarter of a mile S.W. from the southern projection of Steep point, west side of Stuart island.

There is no passage northward of the small island lying E. $\frac{3}{4}$ N., distant 7 cables from Greene point ; rocks which dry at low water lie between that island and the islands a quarter of a mile eastward of it. Southward of these rocks there are rapids, but these are stated to be dangerous at any time of tide.

Anchorage.—Cardero channel has but few places that afford anchorage. Bickley bay on the north side of Thurlow island, and nearly opposite to Philipps arm, is about 3 cables in extent with from 16 to 21 fathoms water, and near its head 6 fathoms. Vessels may also bring up in 15 fathoms in Crawford anchorage inside the Erasmus islands on the north shore of Thurlow island, $1\frac{1}{2}$ miles N.E. by E. from Mayne passage.

Mayne passage, $3\frac{1}{2}$ miles eastward of Loughborough inlet, and also on the north side of Thurlow island, affords shelter in from 9 to 15 fathoms water. This passage branches off to the southward and westward, probably communicating with Johnstone strait, but it has only been partially examined ; it is, however, reported to be a good clear channel.

Caution.—When bound from Bute inlet to the north-westward, vessels should proceed to the eastward of Valdes and Read islands by the Calm and Sutil channels, round cape Mudge, and through

Discovery passage, and not attempt to shorten the distance by using Cardero channel.

Tidal streams.—The streams in Cardero channel run at the rate of from one to 2 knots in the western part, increasing to 3 and 4 knots eastward of Nodales channel; between Dent island and the eastern entrance to the inlet they run with great rapidity, especially in the narrow passage between Dent and Valdes islands which, as before observed, is full of whirlpools and overfalls.

Frederick arm branches northward from Cardero channel, opposite Hall point, and extends about three miles in that direction, shoaling gradually at its head towards a stream which here enters the inlet flowing from a sheet of water extending some distance to the northward, and known as the Estero basin.

The flats usually found extending a considerable distance from the shore at the head of most of the numerous inlets or fiords, and which are invariably steep-to, only extend a very short distance off shore at the head of Frederick arm, and are not so steep-to, and it, therefore, appears to afford a better anchorage than any of the other inlets on the mainland, being only exposed to the southward. Anchorage may be had at a reasonable distance from the shore.

Philipps arm, lying immediately westward of Frederick arm, extends about 5 miles in a N.N.E. direction, shoaling gradually off the flats at its head.

LOUGHBOROUGH INLET penetrates the continent for 17 miles in a northerly direction; it has much the same characteristics as most of the arms that indent the north-west coast of North America, being almost hemmed in by precipitous mountains rising abruptly from the shore, and having great depth of water with but little anchorage. At the entrance between Styles and Grismond points, at its junction with Cardero and Chancellor channels, the inlet is about 8 cables wide, which is the average width to within about one mile from the head, when it opens out to 1½ miles.

From the entrance the inlet extends north for 6 miles as far as Cosby point, which projects from the west side, its direction for 7 miles is then N. by W. ½ W., turning at Towry head into Cooper reach, which takes a gentle curve between N.E. and North for 4 miles to the head, terminating in Fraser and McBride bays, which are

separated by Pan point jutting out in the centre. The latter bay affords anchorage in about 25 fathoms at 3 cables from the shore ; in the former the water is very deep until close in.

Sidney bay, $2\frac{1}{2}$ miles South from Cosby point on the west shore, and $6\frac{1}{4}$ miles north from Styles point, extends about three-quarters of a mile to the westward and is about one cable wide, affording anchorage for coasters near its head in 16 fathoms.

Beaver creek, on the west shore of Loughborough inlet, 4 miles within the entrance, extends 2 miles in a south-westerly direction, varying from one to 3 cables wide, and shoaling gradually towards its head, where good and sheltered anchorage may be obtained in 7 fathoms ; anchorage may also be obtained in about 15 fathoms in mid-channel westward of Goat islands. Do not pass northward of Goat islands (lying half a mile within the entrance), as they are connected to the north shore by a flat which dries at low water. Good water may be obtained from a stream at the head of the creek, and firewood (cedar) may be cut for steaming purposes.*

Tides.—The tidal streams in Loughborough inlet are not strong, seldom exceeding a rate of from one to 2 knots an hour. It is high water, full and change, in Beaver creek at 3h. 0m. ; springs rise 16 feet.

* See plan of Beaver creek on Admiralty chart. No. 580 ; scale, $m = 3.0$ inches.

CHAPTER VII.

FROM GEORGIA STRAIT WESTWARD TO CAPE
SCOTT AND THE SCOTT ISLANDS.

Variation 24° E. in 1898.

DISCOVERY PASSAGE, formed between the west side of Valdes island and the Vancouver coast, is the only safe navigable outlet from the north part of Georgia strait to the N.W. Its length in a N.W. and S.E. direction from cape Mudge to Chatham point is $23\frac{1}{2}$ miles, and its average breadth a little more than one mile; but at Seymour narrows it contracts to less than half a mile. Its shores, southward of the narrows, are moderately high and apparently fertile, but northward of them steep, rugged, and mountainous.*

For steamers, the navigation of the inner waters between cape Mudge and the Pacific is very simple, the only caution required being to steer mid-channel; if the weather be fine, except in the vicinity of the Nimpkish river, Helmcken island, and Seymour narrows, these waters may be navigated as well by night as during the day, the shores being so high on either side as to be easily defined.

If in a sailing-vessel, unless the wind be fair and likely to remain so, it would be preferable to anchor for the night, as the wind usually falls after sunset, especially during summer months.

Water is generally so plentiful that at every valley or beach a stream will be found.

Supplies.—Whenever a vessel stops, the natives will generally bring alongside deer, grouse, salmon, rock cod, and other fish in moderate quantities, selling them at reasonable prices. Blankets, shirts of the most common description, knives, beads, powder, shot, tobacco, and red paint are very useful to barter with. To men-of-war they are usually very civil, but crews of coasters and merchant

* See Admiralty chart:—Strait of Georgia, sheet 2, No. 580; scale, $w = 0.5$ of an inch.

vessels should watch them vigilantly, as they are cunning and treacherous (especially near the northern parts of Vancouver island), having captured several small coasters and murdered their crews.

Tides and tidal streams.—Southward of Seymour narrows the streams run from 4 to 6 knots at springs, and turn at high and low water by the shore. At the southern entrance, near cape Mudge and between it and Willow point, heavy races or tide rips rage during the flood, which would be dangerous to small vessels in blowing weather. It is high water, full and change, at 5h. 30m., and the rise and fall is about 11 feet.

Northward of Seymour narrows the tidal streams are comparatively slack; they run from $1\frac{1}{2}$ to $2\frac{1}{2}$ hours after high and low water.

For tides in Seymour narrows, *see* page 250.

Quathiaski cove.—Cape Mudge, with the bank off it to the south-east, have been already described (*see* page 209). From it the west side of Valdes island takes a north-westerly direction, and at the distance of 3 miles is a small indentation named Quathiaski cove, bordered by a sandy beach. The cove, which is about 6 cables long in a N.W. and S.E. direction, and nowhere half a mile wide, is only fit for steamers or small craft, and only affords room for one vessel to moor in its south-east, and another in its northern part; the former is recommended, about one or 2 cables S.E. from Grouse island, in 10 fathoms, well sheltered from all winds. The tidal streams set slightly through the cove, but sweep strongly past the entrance.*

The land between cape Mudge and Quathiaski cove is about 100 feet high, flat, and fertile; an Indian village of considerable extent stands midway between the two places.

Grouse island, in the centre of the cove, is small and moderately high; a shoal extends for two-thirds of a cable off its south-east point, which ought to be guarded against when entering.

If intending to anchor in Quathiaski cove, enter south of Grouse island (paying careful attention to the tides), and keep well over towards the south shore until inside. In the middle of the channel north of Grouse island is a shoal with only a depth of 3 fathoms on it.

See chart, No. 580.

* *See* plan of Quathiaski cove on Admiralty chart, No. 2,067; scale, $m = 3$ inches.

Moor midway between the south-east point of Grouse island and the opposite shore, in from 7 to 10 fathoms. If necessary a vessel may proceed to the north part of the cove inside Grouse island, and anchor in from 7 to 9 fathoms. Careful attention to the helm is important.

Gowlland harbour, about 5 miles N.W. from cape Mudge, is upwards of $2\frac{1}{2}$ miles long in a N.W. and S.E. direction, and from a quarter to two-thirds of a mile broad. The shores are rugged, and there are several rocks and islands within it. Steep island, off the entrance, is about 100 feet high, 4 cables long N.W. and S.E., and one cable wide; the western side is clifly. Gowlland island is about one mile long and a quarter of a mile wide, high and rugged, with a hill at both ends, the southern one being nearly 400 feet high.*

Entrance bank lies nearly across the entrance to the harbour, and partly dries at low water; it is composed of sand, being 4 cables in length N.W. and S.E., and one cable broad; there is a clear passage on both sides of it, with not less than 4 fathoms; its south end, in 3 fathoms, is one cable North from Vigilant point, the north-west extreme of Gowlland island.

If entering Gowlland harbour from the southward round Steep island at about one cable, and steer E.N.E. for Vigilant point, which is steep-to, and ought to be rounded at less than half a cable to avoid Entrance bank. Having passed the point, anchor in 5 to 7 fathoms, muddy bottom, at about 2 cables East from it, or proceed further south-east, where more extended anchorage will be found. The passage south of Gowlland island is choked with rocks.

If coming from the north-west, when Vigilant point bears East, steer for it, passing it as before directed.

Tides.—It is high water, full and change, in Gowlland harbour at 5.30 p.m.; springs rise 11 feet.

The tidal streams run swiftly between Steep and Gowlland islands, and caution is necessary when entering the harbour.

Maud island.—From Gowlland harbour to Seymour narrows the coast takes a W.N.W. direction, being steep-to, high, and rugged. Maud island, the south-east point of the narrows, is small, about 300 feet high, and there is a boat passage between it and Valdes island; Yellow islet lies 4 cables E.N.E. from it.

*See Plan of Gowlland harbour, on Admiralty chart, No. 2,067; scale, $m = 3$ inches.

Willow point (Vancouver island), the south-west point of Discovery passage, lies nearly 2 miles S. by W. from cape Mudge. It is low, covered with willow bushes, and off it a sandstone ledge extends N.E. for nearly 3 cables. When passing the point do not approach it within half a mile. From Willow point a low coast trends north-west for 7 miles to Orange point, and is bordered the whole distance by a sandy beach.

Orange point is bare and round, of a reddish colour, not unlike the top of an orange. A boulder spit extends $1\frac{1}{2}$ cables N.W. by N. from Orange point, its outer limit being marked by kelp in 4 fathoms. About $1\frac{1}{2}$ miles S.E. from Orange point is the entrance of the Campbell river, a large stream of fresh water, navigable for some distance by boats or canoes.

Duncan bay, of which Orange point is the east extreme, is about half a mile deep, and affords good anchorage in 14 to 7 fathoms, sand, well out of the tide, and sheltered from all except N.W. winds. There is a broad sandy beach at the head of the bay, through which a stream of water flows. This bay is easy of access.*

A good position to anchor is at from 3 to 5 cables W. $\frac{1}{2}$ S. from Orange point, in from 7 to 14 fathoms.

Warspite rock is a dangerous pinnacle nearly midway between Orange and Race points on the west shore of Discovery passage. The rock, with 4 feet on it at low water spring tides, rises above a patch about 80 yards in extent within the 5-fathoms line. The danger is steep-to on its north and east sides, and between it and the shore are 3 to 8 fathoms. The position is at times marked by kelp, but with the tidal stream strong, the kelp is run under and cannot be seen. It lies with Middle point bearing S.W. distant $1\frac{1}{2}$ cables, and Race point N.W. $\frac{1}{2}$ W.

Race point, rocky and bare of trees, lying about 3 miles N.W. from Duncan bay, is bold and steep-to. The tidal streams run past it with great velocity, and, during the flood stream, the overfalls off it are very dangerous for boats.

MENZIES BAY has hitherto been little frequented, chiefly from the presumed difficulty of entering or leaving the bay whilst the stream is running strongly in Seymour narrows.†

See chart, No. 580.

* *See plan of Duncan bay on Admiralty chart. No. 538; scale, m = 2.0 inches.*

† *See plan of Menzies bay, No. 538; scale, m = 8 inches.*

Defender shoal, in the centre of the bay, has of late years extended considerably, closing the southern channel to ships of heavy draught. The northern channel has a depth of $4\frac{1}{2}$ fathoms at low water, and is three-quarters of a cable wide between the 3 fathoms lines, and several rocky patches exist off various points. There is excellent anchorage inside of Defender shoal in from 5 to 7 fathoms, good holding ground, and no current. A more convenient anchorage when only waiting for tide is off Trout river in 5 to 6 fathoms, where there is no inconvenience from the tide or swirls, and is to be preferred to Duncan bay.

When entering, and the stream is running strongly, get into the slack water about the middle of the bay, and giving Stephenson point a good berth, keep close along the high land, on the north-east side of the bay, and when abreast a conspicuous green ravine with a large gray boulder, you are in the narrowest part, and should not be more than half a cable from the shore, which is steep-to; as soon as this bight is passed, haul out and anchor as convenient.

Besides the two rivers, there is good fresh water in Nymph cove.

Tidal streams.—When a strong flood is running in the narrows, the volume of water rushes past Wilfred point, and striking on a point midway between Race and Huntingford points, the stronger stream goes towards the race, the other follows the coast to Huntingford point, where it is deflected and lost in the middle of the bay.

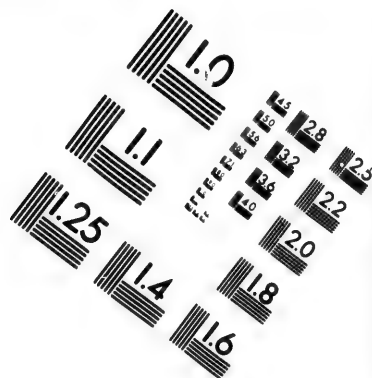
With a strong ebb the edge of the stream from Race point strikes upon Stephenson point, but without much force, that running westward being lost almost immediately. There is no swirl to speak of inside a concave line drawn between Race and Stephenson points.

SEYMOUR NARROWS, at $10\frac{1}{2}$ miles N.W. by W. from cape Mudge, is a narrow strait about $1\frac{1}{2}$ miles long, and only from 3 to 5 cables wide, the shores on both sides being high, rugged, and steep-to.*

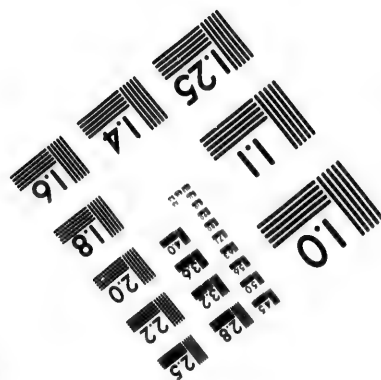
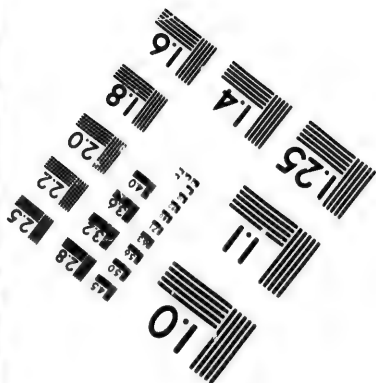
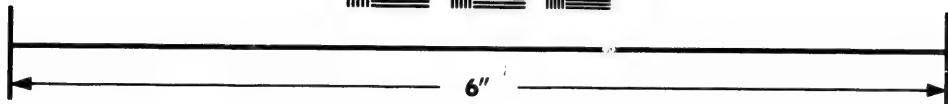
The narrows are dangerous for large vessels during the strength of either stream, and it is recommended to only enter at or near slack water, and to keep the eastern shore aboard in order to avoid Ripple rock. The strictest attention to the steerage is essential.

It is stated on good authority that a vessel steaming at the rate of 13 knots has been unable to make headway, and even to be set back, while attempting the narrows during spring tides; also, that during the south-going stream an eddy sets N.W., close to the cliffs on the western shore, which those having good local knowledge have taken advantage of.

* See Admiralty plan of Seymour narrows, No. 538; scale, $m = 2\cdot0$ inches.



A resolution test chart featuring various patterns of horizontal and vertical lines of increasing frequency. Each pattern is accompanied by a numerical value indicating its resolution. The values include 1.0, 1.1, 1.25, 1.4, 1.6, 1.8, 2.0, 2.2, 2.5, 2.8, 3.2, 3.6, 4.0, 4.5, 5.0, 5.6, 6.3, 7.1, 8.0, 9.0, 10, 11.2, 12.5, 14, 16, 18, 20, 22.5, 25, 28, 32, 36, 40, 45, 50, 56, 63, 71, 80, 90, 100, 112, 125, 140, 160, 180, 200, 225, 250, 280, 320, 360, 400, 450, 500, 560, 630, 710, 800, 900, 1000, 1120, 1250, 1400, 1600, 1800, 2000, 2250, 2500, 2800, 3200, 3600, 4000, 4500, 5000, 5600, 6300, 7100, 8000, 9000, 10000, 11200, 12500, 14000, 16000, 18000, 20000, 22500, 25000, 28000, 32000, 36000, 40000, 45000, 50000, 56000, 63000, 71000, 80000, 90000, 100000, 112000, 125000, 140000, 160000, 180000, 200000, 225000, 250000, 280000, 320000, 360000, 400000, 450000, 500000, 560000, 630000, 710000, 800000, 900000, 1000000, 1120000, 1250000, 1400000, 1600000, 1800000, 2000000, 2250000, 2500000, 2800000, 3200000, 3600000, 4000000, 4500000, 5000000, 5600000, 6300000, 7100000, 8000000, 9000000, 10000000, 11200000, 12500000, 14000000, 16000000, 18000000, 20000000, 22500000, 25000000, 28000000, 32000000, 36000000, 40000000, 45000000, 50000000, 56000000, 63000000, 71000000, 80000000, 90000000, 100000000, 112000000, 125000000, 140000000, 160000000, 180000000, 200000000, 225000000, 250000000, 280000000, 320000000, 360000000, 400000000, 450000000, 500000000, 560000000, 630000000, 710000000, 800000000, 900000000, 1000000000, 1120000000, 1250000000, 1400000000, 1600000000, 1800000000, 2000000000, 2250000000, 2500000000, 2800000000, 3200000000, 3600000000, 4000000000, 4500000000, 5000000000, 5600000000, 6300000000, 7100000000, 8000000000, 9000000000, 10000000000, 11200000000, 12500000000, 14000000000, 16000000000, 18000000000, 20000000000, 22500000000, 25000000000, 28000000000, 32000000000, 36000000000, 40000000000, 45000000000, 50000000000, 56000000000, 63000000000, 71000000000, 80000000000, 90000000000, 100000000000, 112000000000, 125000000000, 140000000000, 160000000000, 180000000000, 200000000000, 225000000000, 250000000000, 280000000000, 320000000000, 360000000000, 400000000000, 450000000000, 500000000000, 560000000000, 630000000000, 710000000000, 800000000000, 900000000000, 1000000000000, 1120000000000, 1250000000000, 1400000000000, 1600000000000, 1800000000000, 2000000000000, 2250000000000, 2500000000000, 2800000000000, 3200000000000, 3600000000000, 4000000000000, 4500000000000, 5000000000000, 5600000000000, 6300000000000, 7100000000000, 8000000000000, 9000000000000, 10000000000000, 11200000000000, 12500000000000, 14000000000000, 16000000000000, 18000000000000, 20000000000000, 22500000000000, 25000000000000, 28000000000000, 32000000000000, 36000000000000, 40000000000000, 45000000000000, 50000000000000, 56000000000000, 63000000000000, 71000000000000, 80000000000000, 90000000000000, 100000000000000, 112000000000000, 125000000000000, 140000000000000, 160000000000000, 180000000000000, 200000000000000, 225000000000000, 250000000000000, 280000000000000, 320000000000000, 360000000000000, 400000000000000, 450000000000000, 500000000000000, 560000000000000, 630000000000000, 710000000000000, 800000000000000, 900000000000000, 1000000000000000, 1120000000000000, 1250000000000000, 1400000000000000, 1600000000000000, 1800000000000000, 2000000000000000, 2250000000000000, 2500000000000000, 2800000000000000, 3200000000000000, 3600000000000000, 4000000000000000, 4500000000000000, 5000000000000000, 5600000000000000, 6300000000000000, 7100000000000000, 8000000000000000, 9000000000000000, 10000000000000000, 11200000000000000, 12500000000000000, 14000000000000000, 16000000000000000, 18000000000000000, 20000000000000000, 22500000000000000, 25000000000000000, 28000000000000000, 32000000000000000, 36000000000000000, 40000000000000000, 45000000000000000, 50000000000000000, 56000000000000000, 63000000000000000, 71000000000000000, 80000000000000000, 90000000000000000, 100000000000000000, 112000000000000000, 125000000000000000, 140000000000000000, 160000000000000000, 180000000000000000, 200000000000000000, 225000000000000000, 250000000000000000, 280000000000000000, 320000000000000000, 360000000000000000, 400000000000000000,



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Coming from the southward, Duncan bay and Menzies bay are convenient anchorages for awaiting slack water at Seymour narrows.

Northward of the narrows, Discovery passage takes a north-westerly direction for 12 miles to Chatham point, the shores becoming more high and rugged than before. On the eastern shore are several bays or openings, but, with the exception of Plumper bay, are too deep to afford anchorage: the western shore is nearly straight, and near Chatham point are Otter cove and Elk bay, both affording anchorage.

Ripple rock.—A dangerous rock, about $1\frac{1}{2}$ cables in extent, in a N.N.W. and S.S.E. direction, with a depth of $2\frac{1}{2}$ fathoms on it, lies nearly in the centre of Seymour narrows, but rather on the western side. Its shoalest part lies 3 cables S.S.W. $\frac{1}{2}$ W. from the north-west point of Maud island, and nearly 2 cables from the nearest land of Wilfred point; it is near the position of the heaviest tide race.

Tides and tidal streams.—It is high water, full and change, in Seymour narrows, about 4h. 0m., springs rise about 12 feet. In April a small diurnal inequality of height was observed at high water, but at low water there was usually an inequality of 6 to 8 feet.

The south-going stream begins from 15 to 30 minutes after low water, and runs until high water, or about 10 minutes after it. The duration of slack water after both streams is generally 10 to 20 minutes, but sometimes there is no slack. The north-going stream begins from 15 to 30 minutes after high water, and runs until low water, or about 10 minutes after it.

In the narrows, both streams attain a rate of 10 knots at springs; south-eastward of Maud island the rate is 5 knots.

It must be noted that although in the summer the times of high and low water, and the turns of the streams are tolerably regular, in the winter or during bad weather they cannot be predicted with any certainty.

Plumper bay, on the Valdes island shore half a mile north from Seymour narrows, is about two-thirds of a mile deep, and the same in width, affording anchorage in from 14 to 9 fathoms, near its south-east part, easy of access, well sheltered, and out of the tide. If unable to proceed through the narrows in consequence of the tide, Plumper bay becomes a very convenient stopping place, and no directions are necessary for entering it.*

* See plan of Plumper bay on Admiralty chart, No. 538; scale, $\text{m} = 2.0$ inches.

The tidal streams and eddies in Plumper bay ; if anchored far out are sometimes strong, causing a vessel to surge heavily on her cables. Caution must be used when anchoring, for a rock lies one cable off shore in the south-east part of the bay.

Deep Water bay, separated from Plumper bay by the peninsula of Separation head, is about one mile deep, and half a mile broad, but too deep for anchorage.

Granite point is a high white granite bluff on the eastern shore of Discovery passage, at 9 miles N.W. by N. from Seymour narrows. On both sides of the point is an opening, the southern one extending eastward for nearly 3 miles, and containing several islands. At 2 cables N.W. from Granite point is a rock with only 9 feet water on it.

Okishollow channel, immediately northward of Granite point, divides Valdes island and joins Hoskyn inlet at Surge narrows. Seven miles from Granite point, an arm, locally known as Hole in the Wall, branches off to the north-east into Bute inlet, 2 miles below Stuart island ; in this arm the tidal streams are rapid, 7 to 9 knots. These passages are unsurveyed and should not be attempted. They are used by small local steam vessels calling at the logging camp in Wyatt bay. It is high water, full and change, at Surge narrows, at 6 hours ; springs rise 12 feet.

Elk bay, on the west side of Discovery passage, at 9 miles N.W. from Seymour narrows, is about $1\frac{1}{2}$ miles broad and three-quarters of a mile deep. It affords indifferent anchorage, in 14 to 15 fathoms, about one-third of a mile from the head, and exposed to northerly winds ; Otter point, its southern extreme, slopes gradually to the sea, with a small shingle beach running off.

A rock which covers at half flood lies $1\frac{1}{2}$ cables off shore, three-quarters of a mile N.W. from Elk bay.

Otter cove, on the west side of Discovery passage, $3\frac{1}{2}$ miles from Otter point and just south of Chatham point, is a small but snug anchorage, sheltered from all winds by Limestone island (about 100 feet high), in the centre of the entrance. Snag rock with only 2 feet water on it lies one cable E.N.E. from Limestone island.*

* See plan of Otter cove on Admiralty chart, No. 580 ; scale, $m = 3$ inches.

If intending to anchor in Otter cove, pass north of Limestone (Lewis) island, and anchor midway between it and the head of the cove, in from 10 to 6 fathoms ; a large vessel should moor.

The passage south of Limestone island is choked with kelp, the least water obtained was 4 fathoms, but there is probably less.

The time of high water, full and change, in Otter cove is uncertain.

Chatham point, a low rocky point, nearly 24 miles from cape Mudge, is the north-west extreme of Discovery passage, and also separates it from Johnston strait. Discovery passage is here $1\frac{1}{4}$ miles wide. Chatham point is situated in latitude $50^{\circ} 20' 30''$ N., longitude $125^{\circ} 28' 40''$ W.

Beaver rock, awash at low water, lies 2 cables N.E. from the north extreme of Chatham point ; in rounding the point, the shore should not be approached nearer than half a mile. A rock, sometimes marked by kelp, with a depth of about 15 feet on it at low water, lies 4 cables off Chatham point, with Beaver rock S.W. $\frac{1}{2}$ S. about 2 cables ; and eastern extreme of Chatham point S. $\frac{3}{4}$ E. Between the point and Nodales channel are several strong eddies or tide rips.

The point on Valdes island, opposite Chatham point, has a nearly bare steep rocky face, not much higher than Chatham point.

Directions.—Northward of Seymour narrows, the tidal streams being weaker (3 to 5 knots), proceed in mid-channel. Chatham point should not be approached nearer than half a mile. Plumper bay, as before mentioned, affords good anchorage if waiting for the tide to proceed through Seymour narrows from the northward.

NODALES CHANNEL is 8 miles long in a N. by E. direction between Thurlow and Valdes islands, and leading into Cardero channel ; its western entrance, which is upwards of one mile wide, with deep water, is $1\frac{1}{2}$ miles N.E. by N. from Chatham point ; there are some tide rips off it.

Hemming bay.—In Hemming bay, on the west side of Nodales channel, a rock of small extent with a depth of 6 feet, and not marked by kelp, lies nearly in the middle of the bay, about W.S.W. 4 cables from the northern Lee islet. The water in the bay outside the rock is deep ; between the rock and the head are 17 fathoms.

Hardinge island, 300 feet high, about three-quarters of a mile long and a quarter of a mile wide, is about one mile W. by N. from the entrance to Cameleon harbour, with a passage on both sides. Young passage, to the southward, is a quarter of a mile wide, and Burgess passage, to the northward, half a mile; there is deep water in both.

Maycock rock.—Three-quarters of a mile W. $\frac{1}{4}$ S. from the south entrance point of Cameleon harbour, and 6 cables W. by S. from Bruce point, is Maycock rock, with one fathom on it. The shore to the eastward of this rock for half a mile has foul ground marked with kelp extending from it one cable.

Cameleon harbour on the south-east shore of Nodales channel (Valdes island) is about one mile deep in an E.S.E. direction, and has an average width of 3 cables. The entrance, between Bruce point on the north shore and a small islet off the south shore, is less than 2 cables wide, and caution must be observed in rounding Bruce point in order to avoid Douglas rock lying half a cable off it. It is advisable to keep well outside the kelp when entering.*

Anchorage, sheltered from all winds, in from 8 to 10 fathoms, may be obtained at 2 cables from the head. The lead should be kept going quickly in approaching the head as the flat which extends nearly 200 yards from it is steep-to.

It is high water, full and change, in Cameleon harbour at 3h. 0m.; springs rise 16 feet, neaps $11\frac{1}{2}$ feet.

JOHNSTONE STRAIT, which separates the north-east side of Vancouver island from the mainland, is comprised between Chatham point and Beaver cove, being about 55 miles in length W. by N. and E. by S., with a varying breadth of one to 2 miles. The shore on both sides is high and rugged, more especially the southern, which may be said to be a continuous mountain range, rising, almost abruptly from the sea, the summits of which vary from 2,000 to 5,000 feet in height, some of the higher ones being snow-clad all the year round.†

There are no anchorages whatever along the south shore, but there are several on the northern, viz., Vere cove, Knox, Blinkinsop, and

* See plan of Cameleon harbour on Admiralty chart, No. 580; scale, $m = 3$ inches.

† See Admiralty chart of Johnstone and Broughton straits and Queen Charlotte sound, No. 581; scale, $m = 0.5$ of an inch.

Forward bays, as well as ports Harvey and Neville, all of which, except the latter, being easily accessible to sailing-vessels.

Bauza cove, one mile east of Beaver cove, is a small deep bight, and affords no anchorage; some small islets lie in its entrance.

Ripple shoal consists of three pinnacle rocks on a shoal about one mile long E. $\frac{1}{2}$ N. and W. $\frac{1}{2}$ S., on which the least depth is 10 feet, from which Eden point bears N. 42° E. distant $1\frac{2}{10}$ miles. A can buoy with red and black horizontal stripes marks the eastern side in 6 fathoms. *See* page 262.

Tides and tidal streams.—Everywhere in Johnstone strait it is high water, full and change, at 0h. 30m., and the rise and fall of tide is from 15 to 17 feet. The streams run from 2 to $2\frac{1}{2}$ hours after high and low water by the shore, and except in the vicinity of Helmcken island and eastward of Knox bay, they are not strong. In the former place they run from 3 to 6 knots, and in the latter 2 to 4 knots; but in other parts of the strait they seldom exceed one to 3 knots per hour. Near Helmcken island are several heavy tide rips, which in blowing weather would be dangerous to boats or small craft; and just west of Chatham point is an overfall producing a considerable swell at times.

Thurlow islands are on the north side of Johnstone strait, westward of Nodales channel; their south side, which borders the strait, is rocky and about 13 miles long in a westerly direction; the eastern half is indented by several bays, off which lie some small islands.

These islands are mountainous, rising to elevations of from 1,400 to more than 2,000 feet; mount Eldon, near the centre of the islands northward of Pender islands, wooded and square-topped, and quite isolated, is remarkable, and 2,011 feet high.

Knox bay, on the south side of Thurlow island, and 7 miles westward of Chatham point, is two-thirds of a mile deep and about the same in width, affording anchorage in from 15 to 17 fathoms at 2 cables from the head, off the edge of the bank, which is steep-to. The anchorage is well protected from east or westerly winds, but it ought only to be used as a stepping place for the night or tide, as

See chart, No. 581.

from the steepness of the bank a vessel would touch if a southerly wind sprang up. Off its south-west point foul ground extends for nearly one cable. If intending to anchor, steer for the head of the bay, and anchor immediately 16 fathoms are obtained.

It is high water, full and change, in Knox bay at 0h. ; springs rise 16 feet, neaps 12 feet.

Pender islands, between Knox bay and Nodales channel, are very rugged and barren, the largest being 150 feet high ; foul ground exists to the east and west of them for nearly half a mile, and their south side should not be approached nearer than 2 cables. The tidal streams set strongly between them.

Eden point, the southern entrance point of Chancellor channel and the north-west extreme of Thurlow, is bold and cliffy ; half a mile south-east of it is a small bay, too deep to afford anchorage, except for small craft.

Ripple point, on the south or Vancouver shore of the strait, 6 miles West from Chatham point, is steep-to, and between it and Knox bay are some heavy tide rips in blowing weather.

Camp point, $9\frac{3}{4}$ miles W. by S. $\frac{1}{2}$ S. from Ripple point, slopes gradually to the sea ; a rocky beach extends a short distance off it ; and half a mile N.E. of it is Ripple shoal, with from 7 to 9 fathoms, marked by keip, about 3 cables in extent, with deep water around it. (See page 254.)

On the line from Eden point to Camp point peak, and close to the Vancouver shore, lies a rock covered at high water.

Salmon bay, $4\frac{1}{2}$ miles westward from Camp point, at high water appears of considerable extent, but affords no anchorage, the bank, which runs off half a mile from its head, being too steep. A river of considerable extent flows into this bay, and is said to be navigable for canoes several miles inland. At this place is the only break in the mountain range on the south shore, and a valley of considerable extent stretches away to the south-east, in the centre of which appears a remarkable bare summit.

Helmcken island, lying 3 miles westward of Thurlow island, in the centre of the strait, is $1\frac{1}{2}$ miles long east and west, and about half a mile wide, with a clear channel of the same width on both

sides of it. The island is about 150 to 200 feet high, with a rugged coast line, and several small islets lie close off its north-east shore.

Speaker rock, which covers at a quarter flood, lies $2\frac{1}{2}$ cables N.E. from its eastern point, and is in the way of vessels using Current passage.

Race passage, southward of Helmcken island, is half a mile wide, but deep; the tidal streams set strongly through it (as much as 6 knots at springs), and there are some heavy tide rips in its eastern part. This is the passage generally used.

Current passage, to the northward of Helmcken, is about half a mile wide, and deep, the tide being as strong as in Race passage.

CHANCELLOR CHANNEL, which is 8 miles long and connects with Cardero channel, lies along the north shore of Thurlow island, and has its entrance between Eden point (the west extreme of Thurlow island) and the south shore of Hardwicke island; it is half a mile wide. A kelp patch is shown on the chart nearly in mid-channel, or three-quarters of a mile East of Darcy point. The depth of water over the patch is not known, and it should be avoided.

WELLBORE CHANNEL, separating the north-east side of Hardwicke island from the mainland, the entrance to which from Chancellor channel is nearly 3 miles north-east of Eden point, takes a W.N.W. direction for 4 miles, communicating with Forward harbour, Topaze harbour, and Sunderland channel. At its entrance is Bulkeley island; pass eastward of it, and keep the eastern shore aboard to avoid some rocks which lie off the shore of Hardwicke island.

Tidal streams.—The tidal streams in Wellbore channel run with great velocity, often attaining at springs a rate of over 7 knots an hour.

Forward harbour, on the eastern side of Wellbore channel, the entrance to which between Louisa and Horace points is only a little over one cable wide, extends nearly 3 miles in a north-east direction, and though the entrance is narrow, its freedom from obstruction renders it easily accessible to vessels of moderate size. Its shores are steep-to, but the water being of moderate depth over its whole extent (12 to 15 fathoms), anchorage may be taken up in any part of it, if requisite. At its head a flat dries out $2\frac{1}{2}$ cables at low water, and two small streams flow into it.*

* See Admiralty plan of Forward harbour, No. 630; scale, $m = 4.0$ inches.

For half a mile within the entrance the passage is from one to 2 cables wide, with depths of 8 to 12 fathoms, but at that distance, the harbour opens and varies from $3\frac{1}{2}$ to 5 cables in width.

Anchorage may, as already mentioned, be taken up anywhere, but the best position is in Douglas bay, on the north shore, just round Mills point, in from 6 to 10 fathoms.

It is high water, full and change, in Forward harbour at 3h. 0m.; springs rise 16 feet, neaps $11\frac{1}{2}$ feet.

Bessborough bay, an open indentation on the north shore of Wellbore channel half a mile north-west of the entrance to Forward harbour, affords no anchorage, owing to the great depth of water in it.

SUNDERLAND CHANNEL.—The entrance, which is subject to heavy tide rips, lies between Fanny reef and the shore near Blinkinsop bay; Sunderland channel is a clear navigable channel extending over 6 miles in a north-east direction to the entrance to Topaze harbour. Except at its entrance, where it is less than one mile wide, it is over a mile in width. Seymour and Poyntz islands lie in mid-channel, the latter near the junction of Sunderland channel with Wellbore channel (*see* page 256). The depths shoal gradually from 50 fathoms at the entrance, to 22 fathoms north of Poyntz island; but there is a deep run of water in that locality and along the shore south of the two islands above mentioned.

Tidal streams.—The tidal streams in Sunderland channel are not strong, attaining a velocity of only from a half to $1\frac{1}{2}$ knots an hour.

TOPAZE HARBOUR, the continuation of Sunderland channel, is, from its entrance (7 cables wide) between Murray island on the east, and the shore under Geneste Cone (1,400 feet high), on the west, nearly 5 miles long in a north-east direction, and nearly one mile wide, gradually narrowing, however, at its head to half a mile in width. Over the whole of this harbour there is an uniform depth of 13 fathoms until within half a mile of its head. On the north side, $1\frac{1}{2}$ miles within the entrance, is Jackson bay, a narrow bight extending $1\frac{1}{2}$ miles in a north-west direction but shoal at nearly a mile from its head.

At the head of Topaze harbour are mounts Drummond and Berkeley, 3,273 and 3,987 feet high respectively.

Anchorage may be obtained, well sheltered, in either Jackson bay or at the head of the harbour, in 10 fathoms.

Tides.—It is high water, full and change, in Topaze harbour at 3h. 0m.; springs rise 16 feet, neaps $11\frac{1}{2}$ feet.

Hardwicke island is high and rugged, and the south shore steep-to, except near its south-west extremity, where Earl ledge runs off for 3 cables, only uncovering at low water.

York island, high round and about half a mile in diameter, and another small low islet half a mile westward of it lie off the west point of Hardwicke, and outside them, at the distance of one-third of a mile, is Fanny reef, which covers or is awash at high water; between the reef and north shore there are some heavy tide rips.

Blinkinsop bay, $2\frac{1}{2}$ miles N.W. of Hardwicke island, and 25 miles from Chatham point, is about $1\frac{1}{2}$ miles deep, and half a mile wide; its shores are high, and from the head a bank dries out at low water for nearly one mile.

Outer rock, which has a depth of 7 feet on it at low water, lies with the summit of Jesse island bearing S.W. by W. $\frac{1}{2}$ W., distant 9 cables; and mount Hardy (2612) N.W. $\frac{3}{4}$ W. A rock awash lies E. $\frac{1}{2}$ S., distant four-tenths of a cable, from Outer rock, and there is a depth of $1\frac{1}{2}$ fathoms between the rock awash and the shore to the north-eastward.

A rock marked by kelp, on which there is a depth of 4 fathoms, lies one cable N.W. by W. from Tuna point, the east entrance point.

This bay affords good anchorage, in 10 to 12 fathoms, about one-third of a mile N.E. from its south-west point, well sheltered and easy of access. The only direction required is to keep in mid-channel, avoiding the above-mentioned rock, and anchor on obtaining 12 fathoms, as the bank is rather steep.

Jesse island, lying about 2 cables off the shore, nearly half a mile S.W. of Blinkinsop bay, is small and steep-to.

PORT NEVILLE trends north-easterly for 7 miles, varying from a quarter to one mile in breadth. It affords a spacious and secure anchorage, but in consequence of Channel rock, lying near the middle of its entrance, great caution is required. Its shores, except near the eastern side of entrance and head, are high, sloping gradually to the shore.*

The entrance is between Milly island and Ransom point (off which is a small rock), thence the channel into port Neville is $1\frac{1}{2}$ miles long, and about 3 cables wide, running in a northerly direction; the

See chart, No. 581.

* *See Admiralty plan of port Neville, No. 630; scale, m = 4.0 inches.*

depths in it vary from 5 fathoms, shoaling to $2\frac{1}{2}$ fathoms in the north part. The best passage is on the western side of Channel rock, there being about 15 feet at low water; the passage eastward of it has only 12 feet. The depth of water in the port varies from 6 to 9 fathoms, with a muddy bottom.

Channel rock, of small extent and very dangerous, having only 4 feet over it, lies in mid-channel $3\frac{1}{2}$ cables S.W. $\frac{1}{2}$ S. from Boulder point, so that unless specially require to enter this port, the anchorage of port Harvey, and Blenkinsop bays, which are at no great distance from its vicinity, ought to be preferred, being both secure and easy of access.

Boulder point, the north-east point of the channel, is low, with a stony beach round it; a shoal extends off it northward and eastward for 5 cables, with $1\frac{1}{2}$ fathoms in some parts.

Robbers Nob is a remarkable low grassy point on the north side of the port, about one mile from Boulder point.

Shoal creek, at the head of port Neville, is about 2 miles long, narrow, and not recommended, as its entrance is only one cable wide, with a rock in the middle; from its head a mud flat extends off nearly one mile.

Anchorage.—The best anchorage is about half a mile south-west of the Nob in 6 or 7 fathoms. Temporary anchorage for a night may also be had at the outer part of the entrance, but the soundings decrease very suddenly when abreast Milly island.

Tides.—It is high water, full and change, in port Neville at 0h. 30m.; springs rise 17 feet, neaps 12 feet; the stream runs from one to 2 knots at the entrance.

Stimpson reef.—At 4 miles W. by S. $\frac{1}{4}$ S. from the entrance of port Neville, and a quarter of a mile off shore, lies Stimpson reef, which covers at half flood.

PORT HARVEY indents the coast in a northerly direction for 4 miles, with a breadth varying from a quarter to three-quarters of a mile, and affords good and well-sheltered anchorage in 7 to 9 fathoms, muddy bottom, at half a mile from its head. There are several small islets (Mist) within it, and the shores are rugged; from its head swampy ground extends north-east, and to the north-west is a narrow gorge which partly fills at high water and joins Knight inlet.*

See chart, No. 581.

* *See Admiralty plan of Port Harvey, No. 634; scale, m = 4.0 inches.*

Broken islands, off the east side of the entrance, are low rugged, and of small extent; foul ground extends from them in a northerly direction for three-quarters of a mile; a boat passage exists eastward of them.

Havannah channel, the entrance of which is $1\frac{1}{2}$ miles north of Broken islands, runs in a north-easterly direction from the east side of port Harvey, connecting it with Call creek. Its length is about 4 miles, and its breadth varies from one-half to one mile; the shores are high and much broken, and the depths in mid-channel vary from 9 to 50 fathoms. There are several islands within it, which lie mostly in mid-channel. Hull island, the largest, is three-quarters of a mile long, and half a mile broad.

Bouhey bay, in the south-east part of Havannah channel, is about one mile deep in a southerly direction, and half a mile broad; a vessel may anchor in this bay at half a mile from the head, in from 10 to 14 fathoms, but the passage to it has not been sufficiently examined to recommend its being used as an anchorage.

Browning rock, in the north part of Havannah channel, about one-third of a mile north of Hull island, has only 12 feet over it, and lies nearly in the fairway of the channel to Call creek; there is an apparently clear passage westward of it.

Caution.—As the soundings are uneven and the bottom rocky west and north-west of Hull island, great care should be used in navigating this channel near that neighbourhood.

Call creek, the eastern termination of the inlet leading from Havannah channel, is of considerable extent, its length in a north-easterly direction being 12 miles, and its breadth varying from a half to $1\frac{1}{2}$ miles; the shores on either side are high and precipitous, rising abruptly to mountains from 1,000 to 4,700 feet in height. The head terminates in a low swamp, and a valley extends north-east from it.

There is no anchorage whatever except near its entrance, on the north side amongst the Warren islands, where from 6 to 14 fathoms will be found. These islands, four in number, and small, are half a mile from the entrance; they are parallel to the shore from one to 2 cables off it. A vessel may anchor between the two southern islands in from 6 to 10 fathoms.

Chatham channel, the east part of which commences at Root point, the north-west extreme of Havannah channel, trends westwards, connecting these waters with Knight inlet; its breadth as far as surveyed varies from 2 to 3 cables, the depth in mid-channel is 4 fathoms. It is not recommended to use this channel until further explored, as only 4 miles of it have at present been examined.

Directions.—If intending to anchor in port Harvey, keep in mid-channel till within the Mist islands, when the anchorage opens out; anchor in 7 fathoms in the middle of the harbour, at about half a mile from the head.

The anchorages in Boughey bay, Havannah channel, and among the Warren islands on the shore of Call creek, are secure; but the passages to them, though probably deep, have not been sufficiently examined to give directions for entering them.

Tides.—It is high water, full and change, in port Harvey at 0h. 30m.; springs rise 10 feet.

Escape reef, lying 2 miles W by S. $\frac{1}{2}$ S. from Broken islands, and half a mile off the north shore of Johnstone strait, is about one cable in extent, has 4 feet least water on it, and is marked by kelp in the summer. This reef, which has deep water around it, is in the track of vessels entering port Harvey from the westward; to avoid it, keep in the middle of the strait till the entrance of the port comes well open, bearing N.N.E. or N. by E., when steer in for it.

Forward bay, 3 miles W.S.W. from port Harvey, is about $1\frac{1}{2}$ miles broad, and three-quarters of a mile deep, with a small islet 30 feet high off its south-west point; its shores are moderately high, and a bank extends nearly 3 cables from its head.

This bay affords good anchorage, in 14 to 10 fathoms, off the edge of the bank, at about two-thirds of a mile N.E. of its south-west point, well sheltered from all except south-easterly winds, and even these send in no sea; it is easy of access for any class of vessel, and a very good stopping place.

Caution.—Entering it from the eastward guard against the Escape reef.

Boat harbour.—From Forward bay, the northern shore of Johnstone strait becomes comparatively low, and trends W. by S. for

15 miles to Weynton passage, at the termination of the strait. Boat harbour, a small cove affording shelter to boats, is 6 miles westward of Forward bay.

HANSON and CRACROFT ISLANDS.—Between Boat harbour and Weynton passage the shores of Cracroft island are low and rocky. The island is about 15 miles long; and off its south west part, at the distance of half a mile from the shore, and $2\frac{1}{2}$ miles east from Blakeney passage, are the Sophia islets, of small extent. Hanson island is separated from Cracroft by a passage one mile wide; its south side is 3 miles long, and off its south-west point are some rocks extending 2 or 3 cables westward.

Growler cove indents the west end of Cracroft island in an E.N.E. direction for three-quarters of a mile, with a width of about $1\frac{1}{2}$ cables, and from 20 to 5 fathoms water. At the head a flat runs out for a short distance.

Directions.—For a steamer, or sailing-vessel with a fair wind, the navigation of Johnstone strait is perfectly easy, it being only requisite to keep in mid-channel, except when nearing Helmcken island from the eastward; when Eden point opens of the south-west point of Thurlow island, keep to the northward until the south extreme of Hardwicke island is seen open of Helmcken island, bearing S. 78° W.; steer for this until the next point eastward of Eden point on the north side of Thurlow island is seen open of Eden point, and the point one mile westward of Camp point bears S.W. by S., when alter course to the southward (avoiding Speaker rock) and keep in mid-channel in the passage south of Helmcken island.

If wishing to anchor for the night, Vere cove, Knox, Blinkinsop, and Forward bays, and port Harvey on the northern side, afford good anchorage, and are, with the present Admiralty charts, easy of access.

BROUGHTON STRAIT, which connects Queen Charlotte sound with Johnstone strait, is upwards of 14 miles in length, east and west, the breadth varying from 4 miles at the east, to one mile at the west entrance. Its southern shore is formed by Vancouver island, and the northern by the south side of Malcolm island, and both, except near Beaver cove, are low. There are several islands, rocks, and shoals in the eastern part; but there is a clear navigable passage along the southern side half a mile wide in the narrowest place.

There are several anchorages along both sides of the strait, available as stopping places,—Alert bay, on the south shore of Cormorant island; port McNeill on the Vancouver shore; and Mitchell and Rough bays on the south side of Malcolm island. Nimpkish river, which disembogues on the south shore of the strait, is a stream of considerable size.

Tides and tidal streams.—In Broughton strait it is high water, full and change, at 0h. 30m.; the rise and fall being 14 or 15 feet. In the navigable channel the streams run from one to 4 knots, but in the Race and Weynton passages 3 to 5 knots, turning everywhere about 2 hours after high and low water by the shore.

Beaver cove, at the south-east extreme of Broughton strait, extends upwards of one mile in a southerly direction, and is half a mile wide; its shores are high, and the depth is too great for anchorage. Mount Holdsworth, a remarkable conical peak, 3,040 feet high, and very conspicuous from the eastward, rises 3 miles S.W. of the cove.*

Nimpkish river, which flows into a shallow bay on the south shore, 5 miles westward of Beaver cove, is upwards of one cable wide at the entrance; a bank dries off it for nearly one mile, leaving a narrow winding channel with about 5 feet water, into the river.*

Nimpkish river is navigable by a steam launch, at low water for about half a mile from the mouth, a rapid then stopping further progress; at high water the rapid is quiet and a launch can reach one mile higher. A red buoy, in 3 fathoms, marks the northern extreme of Nimpkish bank opposite Alert bay.

On the north bank of the Nimpkish, at the entrance, is a small plateau of grassy land, on which are the ruins of the large native village Cheslakee. The river flows through a broad valley bounded by high mountains for a distance of about 6 miles, and then enters lake Karmutsen, an extensive sheet of water 12 miles long.

It is high water, full and change, at Nimpkish river at 0h. 30m.; springs rise 14 feet.

Green islet, off the outer edge of this bank, is about 4 feet above high water, and is small and bare; a rocky ledge which uncovers at low water, extends half a mile East from Green islet, and there is

* See Admiralty sheet of plans, No. 2,067; scale, $m = 3$ inches.

also a rock at the same distance West from it. When navigating the strait, this islet should not be approached within 3 cables.

Port McNeill, on the south side of Broughton strait, about 10 miles West from Beaver cove, runs in W.S.W. for 2 miles, is three-quarters of a mile broad, and affords a good, well-sheltered anchorage in 6 to 9 fathoms. Its shores are low, and bordered by a sandy beach, which extends three-quarters of a mile from the head. From Ledge point, the north point of entrance, a narrow ledge, with from 3 to 5 fathoms on it, extends $1\frac{1}{2}$ miles E.N.E. towards Haddington island; kelp grows over this ledge in summer. A red buoy is moored in 5 fathoms off the eastern extreme of the ledge.

Eel reef, lying 9 cables S.S.W. from Ledge point, and about 2 cables off the south shore of the port, covers at three-quarters flood.

When leaving and bound westward, stand eastward until within half a mile of Haddington island before hauling to the northward round Ledge point.

Pearse islands, in the centre of Broughton strait, at its eastern entrance, are a group of small low islands, with some rocks and reefs extending half a mile north-west, and nearly one mile south-east from them.

Blakeney passage, between Hanson island on the west and the west extremes of Cracroft and Harbledown islands on the east, varies in width from one mile to half a mile. It connects Johnstone strait with Blackfish sound. The strength of the tidal streams in it is from 2 to 5 knots.

Weynton passage, between Hanson and Pearse islands, is about $1\frac{1}{2}$ miles wide, with depths in mid-channel varying from 40 to 60 fathoms. The shores on both sides are very much broken into rocks and small islands; the tidal streams rush through at the rate of from 5 to 6 knots; and unless wishing to anchor in Mitchell bay, it should not be used.

Race passage, between Pearse and Cormorant islands, is two-thirds of a mile wide, but a rock lies in mid-channel at its south part. The tides set at the rate of from 3 to 6 knots through the passage, and it is dangerous.

Cormorant island lies in the centre of Broughton strait, west of Pearse islands. It is about 150 feet high, $2\frac{1}{2}$ miles long, east and west, three-quarters of a mile wide, and bordered by a sandy beach. Gordon point, its south-east extreme, is $2\frac{1}{2}$ miles W. by N. from Beaver cove. A small patch of 4 fathoms marked by kelp lies $1\frac{1}{4}$ miles W. by S. from Leonard point, the north-west point of Cormorant island.

Alert bay, on the south side of Cormorant island, is nearly one mile wide, and half a mile deep, affording a good and well-sheltered anchorage in from 6 to 9 fathoms, muddy bottom; it is easy of access. There is an establishment here for tinning salmon caught in the Nimpkish river; and a pier, at the extremity of which there is a depth of about 12 feet, extends from the north-eastern shore of this bay.*

There is also a mission established, and quite a large Indian village, comprising most of the former inhabitants of Cheslakee.

Yellow bluff, the south-west point of the bay, may be recognised by a remarkable yellow cliff at the extreme of the point.

It is high water, full and change, in Alert bay at 0h. 30m.; springs rise 15 feet.

Haddington island, 7 miles West of Beaver cove, in the centre of Broughton strait, is small; its south and west sides are steep-to, but from the northern shore a bar, with as little as 6 feet water in some parts, connects it with Malcolm island.

Between Haddington island and the ledge running off from the north point of port McNeil is a passage three-quarters of a mile wide, with not less than 7 fathoms water in mid-channel.

MALCOLM ISLAND, which forms the north side of Broughton strait, is $13\frac{1}{4}$ miles long W.S.W. and E.N.E., with an average breadth of nearly 2 miles; the shores are generally low, a sandy beach extending off a short distance from them. On its south side are Mitchell and Rough bays, in which vessels may anchor in 6 or 8 fathoms. Donegal head, its east point, is high, cliffy, bordered by a beach, and the tide runs strongly in its vicinity. Dickenson point, on the south side of the island, 7 miles westward from Donegal head, is connected to Haddington island by a bar, with only 6 feet on it in some parts.

* See plan of Alert bay on Admiralty chart. No. 2,067; scale, $m = 8$ inches.

Trinity bay, on the north side of Malcolm island between Lizard and Boulder points, is an open bay $2\frac{1}{2}$ miles wide and one mile deep. Between the points of the bay the water shoals steeply from 40 fathoms to a ledge having 10 fathoms on its outer edge, but which again shoals rapidly, and is covered with kelp.

Anchorage may, with care, be picked up on the outer edge of this ledge, in 7 fathoms, with Lizard point bearing E. by N. and Black bluff S.W. by W.; but it is exposed to winds from the westward, between North and S.W.

Kelp patch.—Foul ground marked by kelp extends half a mile off the western side of Malcolm island; and $1\frac{1}{3}$ miles W.N.W. from Pulteney point, its south-west extreme, is a shoal patch of $4\frac{1}{2}$ fathoms, also marked by kelp.

Directions.—Passing through Broughton strait from the eastward, when abreast Beaver cove, in mid-channel, a W. $\frac{1}{2}$ S. course, to pass not more than 2 cables south of Cormorant island, will keep a vessel clear to the northward of Nimpkish bank, and when the west point of Cormorant island bears N. by E. she will be westward of it; then steer to round the south-west point of Haddington island within a quarter of a mile, to avoid the ledge off Ledge point, and when the north shore of Cormorant island opens of Haddington island bearing E. by N. $\frac{1}{4}$ N., steer out of the strait in mid-channel. None, except small craft, should go northward of Haddington island.

Those in sailing-vessels would find it tedious to beat through this strait, and as there are several dangers it is not recommended to do so.

QUEEN CHARLOTTE SOUND is an extensive arm of the sea, connecting the inner waters north of Vancouver island with the Pacific. Its length is upwards of 30 miles, running in an easterly direction, and its breadth varies from 10 to 20 miles, being bounded on the north by the shores of the mainland of British Columbia, and on the south by the north shore of Vancouver island. In the north and north-east parts are innumerable rocks and islands; but along its southern sides are two broad and navigable channels to or from the Pacific.*

Broughton strait enters this sound at its south-east part. From thence to Thomas point the coast of Vancouver trends W. by N. for

* See charts Nos. 581, 582

9 miles, and is low; it is bordered the whole distance by a beach composed of sand and boulders, and foul ground marked by kelp extends off it, from a quarter to half a mile.

If intending to enter Beaver harbour from the eastward, do not approach this shore within one mile till near Thomas point; and as but very few soundings have been obtained in this part of Queen Charlotte sound, if beating to windward, great caution ought to be observed when standing to the northward.

Su quash anchorage.—At 7 miles West from port McNeill, the south shore of Queen Charlotte sound is bordered by shoal ground extending 4 cables off, and on which anchorage may be had in from $2\frac{1}{2}$ to 4 fathoms. Care, however, must be observed when anchoring here, as reefs which dry at low water and shoal patches lie scattered about.*

It is high water, full and change, at Su quash anchorage at Oh. 30m.; springs rise 16 feet.

BEAVER HARBOUR, on the south side of the sound, 9 miles westward of Broughton strait, is 3 miles wide at the entrance and 2 miles deep. The harbour is protected by several islands lying across, and within the entrance; its shores are low, and from the south shore a bank extends 3 or 4 cables; a short distance inland from its western side are seven remarkable hills, varying in height from 400 to 640 feet. There is good anchorage in the south and west parts of the harbour, but north-easterly winds send in a heavy sea, rendering it impossible to land in ships' boats on the south shore for days together.†

Thomas point, the south-east extreme of the harbour, is low and rocky; some rocks lie upwards of 2 cables off it to the westward. Moffat rock, 8 cables westward of Thomas point, is 3 cables off shore, just at the outer edge of the bank, and uncovers at low water.

Deer island, two-thirds of a mile North of Thomas point, is about $1\frac{1}{2}$ miles in circumference, wooded, and about 240 feet high; its shores are rocky, and extending nearly 4 cables off its north-west part is a reef marked by kelp, with 9 feet water over it. Eagle island lies close off its south-east point, with a small rock, 15 feet high, not more than a quarter of a cable from its southern extremity.

* See plan of Su quash anchorage on Admiralty chart, No. 581; scale, $m = 6$ inches.

† See Admiralty plan of Beaver harbour, No. 2,067; scale, $m = 3$ inches.

Twin rock lies midway between Round and Peel islands ; a reef extends for more than one cable from its east and south ends, the latter being nearly connected with the shoal extending from the north end of Deer island.

Round island, half a mile N. by E. of Deer island, is small, but high, and conspicuous from the eastward. Peel island, 200 feet high, in the north part of Beaver harbour, is three-quarters of a mile long S.W. and N.E., about one-third of a mile broad, and between it and the west shore of the harbour is Dædalus passage 2 cables wide in the narrowest part, with 17 fathoms water ; at 4 cables north of it are the Charlie islets, small, and two in number.

A rock, marked by kelp, with a depth of 5 feet on it at low water, lies with the northern point of Round island bearing W. by N. $\frac{1}{4}$ N., distant $1\frac{3}{10}$ cables. There is a depth of 2 fathoms, also marked by kelp, distant half a cable S.S.W. from the rock.

Cattle islands, which lie in the middle of the harbour, are small and connected with each other at low water, and at $1\frac{1}{4}$ cables, N.N.W. of the islands, there is a shoal of 3 fathoms.

At $1\frac{1}{2}$ cables south of them is Shell islet, the observation spot on its top is in lat. $50^{\circ} 42' 36''$ N., long. $127^{\circ} 25' 7''$ W. ; a reef awash at high water lies one cable south of it.

Cormorant rock, lying one-third of a mile off the western shore of the harbour, and nearly half a mile West of Shell islet, covers at high water, and has from 4 to 6 fathoms close-to ; midway between this rock and Cattle islands is a shoal patch of $3\frac{1}{4}$ fathoms.

Dillon point, the north-west extreme of the harbour, and separating it from Hardy bay, is bold and rocky ; some small islets lie to the south-east of it close in shore.

Directions.—Beaver harbour is easy of access to sailing-vessels as well as steamers. There are three passages into it, but the southern between Thomas point and Deer island is the best, and generally used. This channel is wide enough for a vessel to beat through ; and the only caution required in entering it, is not to round Thomas point nearer than 2 cables in order to avoid the rocks off its north-west part, after passing which steer for Shell islet.

If entering the harbour by Dædalus passage, steer in mid-channel ; passing between Cormorant rock and the $3\frac{1}{4}$ fathoms shoal $1\frac{1}{2}$ cables eastward of it. A sailing-vessel could not easily work through it,

however, as the breadth abreast Peel island contracts to about $1\frac{1}{2}$ cables.

Anchor in 10 to 12 fathoms about 2 cables south-east from Shell islet, with Thomas point East, or E. by N. Good anchorage in from 6 to 9 fathoms, and better sheltered from all winds, may be obtained westward of the Cattle islands : but in rounding Shell islet give it a berth of about 2 cables to avoid the reef south of it.

Tides.—It is high water, full and change, in Beaver harbour at 0h. 30m. ; springs rise $15\frac{1}{4}$, neaps $11\frac{1}{2}$ feet.

Hardy bay, westward of Beaver harbour, separated from it by Dillon point, indents the coast in a southerly direction for 4 miles ; it terminates in a narrow creek $1\frac{1}{4}$ miles long, and 2 to 4 cables broad, with a sand-bank extending off its head for three-quarters of a mile. The shores of the bay are rugged, and off the west side, near the head, are some outlying rocks.

There is no anchorage, except in the small creek at the head, which is difficult of access, and should not be used by a stranger.

Masterman islands, off the north-east point of the bay, about three-quarters of a mile from the shore, are small, wooded, and four in number ; foul ground exists between them and the shore.

The eastern shores of Queen Charlotte sound consist of an archipelago (Broughton archipelago of Vancouver), 12 miles in length, extending from Hanson island (*see* page 262) on the south, to the entrance to Fife sound on the north. Between the numerous islands, islets, and rocks which form this archipelago, are many narrow channels leading to the entrances of extensive chasm-like inlets, in which the water is of great depth, and the shores rise in almost sheer precipices to a height of from 5,000 to 6,000 feet, and further inland to stupendous peaks, clad in perpetual snow. Down the barren, rugged sides of these mountains rush numberless cataracts, caused by the melting snow. The intense dreariness and gloom in these inlets, and the almost entire absence of life, cause them to present a most unnatural and weird aspect.

Baronet passage.—From Blakeney passage (*see* page 264) along the north shore of Cracroft island, between it and Harbledown island, is a narrow channel 6 miles long, known as Baronet passage. At this distance it splits into several small passages, lying between many small islands, islets, and rocks, the navigation of which must be undertaken with considerable caution.

Kelp rocks lie just within the entrance to Baronet passage, on the north shore, and extend over 2 cables off shore in some places, two of them uncovering at low water 8 and 3 feet respectively; they leave a channel $1\frac{1}{2}$ cables wide along the south shore in which is a depth of 10 fathoms. From here the passage is clear as far as Channel island, 4 miles from the entrance, and maintains an uniform depth of 8 fathoms. The channel on either side of Channel island is less than one cable wide, that to the northward being the deeper.

Steamer passage, between the islands above mentioned as lying 6 miles from the entrance to Baronet passage, is one cable wide, with depths of 10 to 15 fathoms in it. Great care must be observed when passing through Steamer passage, as a dangerous rock, awash at low water, lies a little over 2 cables N.N.W. of it.

Clio channel, the continuation of Baronet passage, to the north-east along the north side of Cracroft island, between it and Turnour island, and communicating with Knight inlet, is 7 miles long. Negro rock (awash at low water), lies in the fairway half a mile S.W. by W. from Sambo point, and to avoid which the south-east shore of Turnour island should be kept aboard at about $2\frac{1}{2}$ cables distant.

Lagoon cove, a small sheltered nook on the north side of Double islands, 2 miles S.E. of the junction of Clio channel with Knight inlet, affords anchorage for a small vessel in 10 fathoms. When entering, pass in mid-channel between the north shore of Double islands and a small round island northward of them, but do so with caution. From the head of Lagoon cove a chain of lakes connect the cove with port Harvey (*see* page 259).

Harbledown island, forming the northern shore of Baronet passage, is $6\frac{1}{2}$ miles long, in an E.N.E. and W.S.W. direction, and 3 miles across at its broadest part, its highest elevation (over Baronet passage) being 1,240 feet.

Parson bay, on the west side of Harbledown island, is $1\frac{1}{2}$ miles deep, and three-quarters of a mile wide, shoaling gradually from 30 fathoms just inside the entrance to 14 fathoms at its head. Anchorage may be obtained in the south-east corner, well sheltered from all but westerly winds blowing down Blackfish sound, in which direction it is open.

Compton island, three-quarters of a mile long east and west, is 380 feet high, and is separated from Harbledown island by White Beach passage. Berry island, north-east of Compton island, is nearly one mile long and forms the east side of Farewell harbour. Lewis island is separated from Berry island by Village passage; it is $2\frac{1}{4}$ miles long, and forms the north side of Farewell harbour, and the entrance to Knight inlet lies along its northern shore.

BLACKFISH SOUND, between the north shore of Hanson island and Swanson island, has an average width of $1\frac{1}{2}$ miles, and leads from Queen Charlotte sound into Parson bay and Blakeney passage to the south-east, and to Farewell harbour and White Beach passage to the northward.

Swanson island, forming the north shore of Blackfish sound, is $2\frac{1}{2}$ miles long, east and west, and one mile wide, with regular bold shores, and only one or two small indentations. Harbour cone, at its east end, is 510 feet high. Numerous small islets and reefs lie off the north shore of the island for nearly one mile.

Freshwater bay, on the south side of Swanson island, about 4 cables westward of the southern entrance into Farewell harbour, affords anchorage for small vessels in 6 fathoms, but it is exposed to southerly winds.*

Farewell harbour is a snug anchorage for a small vessel, half a mile across in every direction. Its approaches, however, both from the northward and southward, are only half a cable wide, that to the northward from the main entrance to Knight inlet being obstructed by the Twilight reefs and several islets lying half a mile outside it. Entering through North passage, Charles point (the west entrance point), kept touching Maggy point (the southern point of North passage on the eastern shore), bearing S.S.E., clears the Twilight reefs, passing eastward of them.*

The southern entrance, named West passage, between Punt rock and Apples island (lying close to the shore of Swanson island), and the Star islands lying off the north-west shore of Compton island, leads out of Blackfish sound and must be approached with caution, as shoal ground extends 2 cables in a south-west direction from the latter islands, having on its extreme a depth of 4 fathoms, leaving a passage to the east of Punt rock only half a cable wide.

Twilight rock, awash at high water, lies 7 cables N.W. by N. from Charles point, and 2 cables W. $\frac{1}{2}$ N. from it is Chick reef, one cable

* See plan of Farewell harbour on Admiralty chart. No. 581; scale, $m = 2\frac{1}{2}$ inches;

in extent, and drying 4 feet. To the westward of the above dangers is a group of small islets and reefs extending along the whole of the north shore of Swanson island nearly one mile from it.

The southern entrance, which should only be taken by a small vessel, should be approached on a N.E. $\frac{1}{2}$ N. bearing, passing three-quarters of a cable from Bare rock (10 feet high) at the east side of Freshwater bay, $2\frac{1}{2}$ cables S.W. from Punt rock; on this bearing Stripe island, a small island on the north shore of the harbour, should be seen midway between Apples and Star islands. When abreast of Apples island haul gradually to the eastward and anchor in 18 fathoms in the middle of the harbour, with north point of Star island bearing W. by S. $\frac{1}{2}$ S., and Maggy point N. by W. $\frac{1}{2}$ W., distant $1\frac{1}{2}$ cables from Compton island.

If it can be clearly made out, the north extreme of Kamux island open a little north of the north-west Star island, bearing N.E., will clear the shoal ground extending south-west of the Star islands.

Tides.—It is high water, full and change, in Farewell harbour at 1h.; springs rise 15 feet, neaps 8 feet.

Village passage, between Lewis and Berry islands, is a narrow but apparently clear channel $1\frac{1}{2}$ cables wide, leading out from the north-east part of Farewell harbour, north of the Carey group, to Native anchorage.

White Beach passage, between Compton island and the north-west point of Harbledown island, is in its narrowest part only 80 yards across, and must be used with great caution. This passage also leads up through Indian passage, south of the Carey group, to Native anchorage.

Village island, 3 miles long and 787 feet high, is situated 2 miles eastward of Lewis island, and is bounded on the north by Knight inlet and separated from Turnour island on the south-east by Canoe passage. The space between Lewis island and Village island is occupied by the Indian islands. A narrow pass, Elliot passage, leads into Knight inlet, between the easternmost of these islands and Village island.

At the south-west end of Village island is Mamalilaculla village, and at the mouth of a small bay to the south-eastward of it, at the entrance to Canoe passage, is Native anchorage, with from 7 to

8 fathoms. Hail islands, two small islets, lie to the southward of it, and Chart and Cecil islets to the westward.

Carey group, is a chain of several small islands lying to the southward of the Indian islands, and stretching across from Berry island to Turnour island, a distance of 3 miles.

Turnour island is 9 miles long E.N.E. and W.S.W., and at its centre 3 miles wide, narrowing towards its extremities; at its eastern end it is 1,580 feet high. It is separated from Harbledown island on the south by Beware passage, Clio channel running along its south-east side, and Knight inlet along its north-west side, the junction of these two passages taking place at Batt bluff, its north-east point.

Beware passage, lying between the north-east shore of Harbledown island and the south-west shore of Turnour island, leads from Native anchorage eastward into Clio channel. Vessels cannot pass through it into Clio channel, owing to a barrier of islets and rocks across it, at one mile from its junction with that channel. An Indian village (Karlukwees) is situated on Turnour island at the eastern entrance to Beware passage.

Canoe passage is a narrow pass leading from Native anchorage along the south-east shore of Village island, between it and Turnour island. At 2 miles up it is completely closed at low water by a stony barrier which dries across, and it is only available for canoes at high water.

KNIGHT INLET.—Main entrance to this inlet, which is one of the most extensive of the sea canals of British Columbia, lies northward of Swanson, Lewis, and Village islands, between them and Midsummer island and several smaller islands and rocks lies $3\frac{1}{2}$ miles E.N.E. from Donegal head, the east extreme of Malcolm island, and may be easily recognised by White Cliff islands, a chain of small islets of a whitish colour situated on the northern side of the passage into the inlet. The entrance between Wedge island on the north, and the north-west shore of Swanson island on the south, is $3\frac{1}{2}$ cables wide, but further east Twilight reefs and Clock rock must be avoided; the former is $1\frac{1}{4}$ miles, and the latter 5 miles from Wedge island. These dangers should be passed to the northward, and Jumble island, lying between them, to the southward,

after which a mid-channel course should be preserved until east of Lady islands.

The entrance proper to Knight inlet, between Warr bluff on the south and Slope point on the north, is three-quarters of a mile wide, and $5\frac{1}{2}$ miles from Wedge island. From thence the inlet trends in a general E.N.E. direction for 33 miles, and then turns suddenly to the northward for $26\frac{1}{2}$ miles to its termination, with an average width throughout of $1\frac{1}{2}$ miles. The shores of the inlet are generally bold, and formed by high mountains rising precipitously from the water's edge, and down the sides of which rush many cataracts produced by the dissolving snow.

The water is everywhere deep, except at a spot about 7 miles eastward of Sargeant passage, where a rocky ridge was found to extend across the inlet, and on which there are heavy overfalls, but no less depth than 23 fathoms was obtained.

There are but few places that afford anchorage; port Elizabeth on the north shore, and Glendale cove on the south being the only two that may be considered available. At $11\frac{1}{2}$ miles east of Slope point, Tribune channel branches off to the northward.

Tidal streams.—The tidal streams at the entrance to Knight inlet run at the rate of from one to 3 knots.

Wedge island, a small round island two cables in extent, lies $3\frac{1}{2}$ cables N.N.W. of the north-west shore of Swanson island, the channel into Knight inlet lying between them; it may be boldly steered for, passing in mid-channel between Wedge island and the small islets lying close to the shore of Swanson island. Surge rocks are a small group of rocky islets lying 3 cables N.N.E. from Wedge island.

White Cliff islands.—From Wedge island a line of small islets, named White Cliff islands, extends over one mile in a N.W. $\frac{3}{4}$ N. direction with patches of shoal water between. A rock awash at high water lies nearly one cable north-westward from the northern islet.

These islands by their colour, as indicated by their name, form a very conspicuous object, and would be most useful for a stranger to identify the entrance to the main channel of the inlet.

The southern White Cliff island is situated in latitude $50^{\circ} 38' 40''$ N., longitude $126^{\circ} 44' 20''$ W.

Midsummer island, separating Knight inlet from Spring passage, is 650 feet high, 3 miles long, and one mile wide. Owl island, one mile in length, east and west, and about half a mile broad, lies off the west end of Midsummer island, with a narrow passage (Providence passage) between them. Passage islet is a small round islet, about midway between Surge rocks and Owl island. From the northern islet of the White Cliff islands another channel leads into Knight inlet on either side of Passage islet.

Jumble island is half a mile long (east and west), and lies 2 miles E.N.E. from Wedge island. On its west side is Night islet, and off its east point, lie the three small Bush islets. When within 2 cables of Night islet haul eastward to pass at that distance southward of it, Jumble island, and the Bush islets.

Indian islands lie on the south side of Knight inlet, between Lewis and Village islands. Between them are several small channels leading to Native anchorage (*see* page 272), but only the easternmost, Elliot passage, is navigable, and that only by small vessels.

Clock rock, which covers at half-flood, lies $2\frac{1}{2}$ cables North of the easternmost of the Indian islands, and is especially dangerous to vessels going through Elliot passage. To clear it keep the coast of Village island aboard 2 cables distant.

Passing up or down Knight inlet, Clock rock may be safely passed by keeping Leading point (on the north shore) in line with Ripple bluff (the north extreme of Village island) bearing N.E. by E. $\frac{1}{4}$ E.

Ridge islands lie on the north side of Knight inlet between the east end of Midsummer island and the south-west shore of Gilford island, at the entrance (from Knight inlet) of Spring passage.

A rock which dries 8 feet at low water, lies 3 cables from the shore of Gilford island; it is, however, out of the fairway of vessels passing up and down Knight inlet, but should be carefully avoided by those passing through Spring passage. Chop bay is a small bight on the north side of Knight inlet opposite Ripple bluff.

Tide rip.—Heavy tide rips occur off Ripple bluff, and between it and Leading point, on the opposite shore, the tidal streams run at a rate of from 2 to 3 knots an hour.

Lady islands, situated 3 miles north-eastward of Leading point, the largest of which is one mile long, but narrow, with several small islets lying off their west extreme, consist of two islands with deep water on both sides of them.

PORT ELIZABETH.—North-westward of the Lady islands a large bight branches off north-west, curving round to the south-west and opening out at its head, forming a sheltered anchorage named port Elizabeth, about one mile in extent; but which is, however, somewhat contracted by two small islands lying in the middle.

Duck cove, south-west of these small islands, forms the termination of the port, a flat dries off its head nearly half a mile.

Anchorage may be taken up as convenient in the southern part of the port in from 9 to 4 fathoms; the latter depths being found south of the eastern island, midway between it and the shore.

Chatham channel, on the south side of the inlet, $3\frac{1}{2}$ miles eastward of the Lady islands, has its entrance between White Nob point (Minstrel island) and Littleton point, where it is over one mile wide. Thence the channel takes a south-easterly direction, and gradually contracting in width and shoaling, it, at 4 miles from the entrance, joins the head of Havannah channel.

Cutter creek, a narrow bight on the east shore of Chatham channel $1\frac{1}{2}$ miles deep, in a north-east direction, terminating in marshy land bordered by a sand-flat, would afford anchorage to a small vessel in 6 fathoms, but caution must be observed when entering, as a small islet (Block islet) lies in mid-channel at the entrance, leaving a passage less than one cable wide on each side of it, that to the south being the better.

Shewell island, lying on the north side of Knight inlet, 2 miles from the entrance to Chatham channel, is $1\frac{1}{4}$ miles long (north-east and south-west) and 280 feet high; it lies at the southern entrance to Tribune channel, which it divides into Clapp and Nickoll passages.

Viscount island, forming the eastern side of the southern entrance to Tribune channel, is 1,950 feet high, 3 miles long north and south, and one mile wide.

Sargeaunt passage (Pumish), one mile east of Nickoll passage, $2\frac{3}{4}$ miles long, is a narrow pass on the east side of Viscount island, and communicates with Tribune channel.

It is high water, full and change, in Sargeaunt passage at 1h. 0m.; springs rise $15\frac{1}{2}$ feet, neaps 12 feet.

Tsa ko nu cove, on the south side of the inlet round Protection point, is probably too deep for anchorage.

Hoeya sound, on the north shore of Knight inlet, 7 miles from Protection point, is a bight half a mile wide, indenting the coast in a N.E. by E. direction. There are depths of more than 40 fathoms over the greater part of the sound, but it shoals suddenly to 5 fathoms at $1\frac{1}{2}$ cables from its head.

Prominent point, on the south shore of Knight inlet, opposite the entrance to Hoeya sound, has a rocky ridge of less water than in the centre of the inlet, extending northward from it, on which there are heavy overfalls; the least depth obtained during the survey was 23 fathoms.

Glendale cove (Kiokh), on the south shore of the inlet, immediately eastward of Macdonald point, takes a S.S.E. direction for $1\frac{3}{4}$ miles, and is three-quarters of a mile wide at its entrance. It dries about half its length, and the water in the remaining part is deep.

A river flows into the head of Glendale cove from a sheet of water one mile distant, named Tom Browne lake, about 5 miles long, which extends nearly to the head of Topaze harbour.

Anchorage may, with care, be taken up in the south-east corner in 23 fathoms, with the right extreme of Observation point in line with Rapid hill, and a large boulder on the west side in line with the junction of Flora and Macdonald ridges, but the bank is very steep-to.

Glacier.—On the east shore, at 14 miles from the head, over a gully, under Glacier peak, there is a remarkable glacier a short distance from the sea. Anchorage was tried for, but no bottom was obtained at one cable from the shore with 40 fathoms of line.

Mount Blair, immediately over the head of the inlet, attains an altitude of 6,550 feet.

Wah shih la..—At $4\frac{1}{2}$ miles from the head of Knight inlet on the west shore, affords the only place where an anchor could be dropped, and by securing to the trees by a hawser, in a depth of 30 fathoms close to the south shore, on west side of the bay.

SPRING PASSAGE, between the south-west end of Gilford island and the north shore of Midsummer island, leading from Retreat passage into Knight inlet, is about half a mile wide, but at the eastern end the channel is contracted by Broken islands to a width of 3 cables; the passage being to the north of these islands.

RETREAT PASSAGE, an entrance to which lies between House and Sedge islands, extends in a northerly direction, between Bonwick and Gilford islands, for 6 miles. Along the shore of Bonwick island, which is bold-to, it is a clear navigable passage; but the eastern shore is skirted by several small islands, islets, and rocks, between which a vessel should not pass.

Seabreeze island is the largest and southernmost of these islands. Whale rock, 3 feet high, lies 4 cables north-east from Seabreeze island, nearly midway between it and Yellow rock at the entrance to Health bay.

Health bay, on the eastern shore, a bight one mile deep in a south-east direction, may, however, be safely entered by passing in mid-channel between the south end of Sail island (which lies off the entrance) and Yellow rock, $2\frac{1}{2}$ cables south of it, or midway between the latter and the shore, when convenient anchorage in 9 to 10 fathoms may be obtained. A narrow passage in the north-east corner of the bay communicates with a lagoon.

Grebe cove, a narrow bight, one to 2 cables broad, on the west shore, extends one mile in a W.S.W. direction, shoaling gradually from 18 fathoms off its entrance, to 6 fathoms at its head. Camp bay, on the east shore opposite Grebe cove, is too small, and has too great a depth of water in it, for anchoring in.

There is a clear channel east of the Fox islands up to the entrance of Cramer passage, passing midway between the eastern islet of the chain and Solitary island.

CRAMER PASSAGE, between the south-east shore of Baker island and north-west shore of Gilford island, leading from Retreat passage north-eastward into Fife sound and to Shoal harbour, is a

navigable channel, 2 cables wide at its southern entrance. A sunken rock lies $1\frac{1}{4}$ cables West from Powell point, the north-east entrance point of the passage.

At the northern entrance, at $1\frac{1}{2}$ cables from the west shore, is a sand patch, about 2 cables in extent, with from 9 to 16 fathoms on it. By preserving a mid-channel course the passage may be boldly taken.

Shoal harbour, on the east shore of Cramer passage, is a narrow inlet $1\frac{1}{4}$ miles long (east and west), to which access is gained by a channel 150 yards across from shore to shore, in some parts less than 40 yards wide between the 3-fathoms lines, and in which there is a depth of only $3\frac{3}{4}$ fathoms. It is only safely available for small coasting vessels, and with local knowledge.

It is high water, full and change, in Shoal harbour at 1h.; springs rise 15 feet, neaps 10 feet.

BONWICK ISLAND is 3 miles long (north and south), and 2 miles across, its highest part being about 770 feet. Off its south-west end, north of Sedge, Start, and High islands, it is skirted by numerous small islets and rocks, between which, near the shore of Bonwick island, sheltered anchorage may be found.

Fog islands are a small group lying off the shore of Bonwick island, on the south side of the entrance to Arrow passage. Evening rocks and the ledges extending W.S.W. from Cove island, lie half a mile southward of them.

Dusky cove, the anchorage above referred to, affords anchorage in 6 to 8 fathoms, about one cable eastward of Cove island, the largest of the islets. It is entered by a passage one cable wide between ledges of rock (which extend in patches half a mile W.S.W. from Cove island) and a chain of islets to the southward. Care must be observed, when entering, to avoid the reefs, which may be cleared by keeping the north point of the small Leading island at the head of the cove in line with the north extreme of South island, bearing E. by N. $\frac{1}{2}$ N.*

The westernmost of the reefs above mentioned (Evening rocks) covers at 6 feet rise, and Ledge rock, the outer of the islets on the south side of the channel, is only 3 feet above high water. Trap and South islands lie eastward of Ledge rock, the former being 25 feet high.

* See plan of Dusky cove on Admiralty chart, No. 581; scale, $m = 2\cdot5$ inches.

It is high water, full and change, in Dusky cove at 1h. 0m.; springs rise 13 feet.

Horse rock, awash at low water, is a dangerous rock lying off the north side of the entrance to Arrow passage, 8 cables W. $\frac{1}{2}$ S. from the westernmost Fog island, and 3 cables S.S.E. from the Coach islands.

ARROW PASSAGE, between Bonwick island to the south-east, and Hudson and Mars islands on the north-west, is a navigable channel. Having passed Horse rock, the passage may be boldly passed through in mid-channel, and if necessary, pass westward of Fox islands, and rounding the northern islet of that group at $1\frac{1}{2}$ cables, pass between it and Steep island and enter Cramer passage.

The Coach islands are a group of several small islands lying on the north side of the entrance to Arrow passage: they extend over a distance of three-quarters of a mile from the south-west end of Hudson island. This island, on the north side of Arrow passage, north-east of the Coach islands, is one mile long, and $3\frac{1}{2}$ cables broad. Mars island, $2\frac{1}{4}$ miles long, and three-quarters of a mile wide, lies close to, and north-eastward of Hudson island. Spiller passage, between it and Hudson island, leads out north-west amongst the islets on the south-west side of Eden island, and into Trainer and Philips passages.

SUNDAY HARBOUR is a small but sheltered anchorage affording refuge for small vessels. The western entrance is between Scrub island and Huston island (a small islet lying 2 cables north of it). Half a mile in, the channel contracts to less than one cable between Narrows island and Island point, between which is a ridge with $4\frac{1}{2}$ fathoms on it, deepening again to 7 fathoms. There is a passage out to the eastward leading into Spiller passage.*

Crib island, forming the north-west shore of Sunday harbour, is $1\frac{1}{4}$ miles long, and half a mile wide at its broadest part.

Anchorage should be taken up in mid-channel as convenient, but at not more than 3 cables from the Narrows, in 5 fathoms, with Bush point bearing N. $\frac{1}{2}$ E., and north point of Kate island shut in with Island point.

* See plan of Sunday harbour on Admiralty chart, No. 581: scale, $m = 2\frac{1}{2}$ inches

It is high water, full and change, in Sunday harbour at 1h.; springs rise 13 feet.

Eden island, forming the south-eastern shore of the entrance to Fife sound, is about 4 miles long E.N.E. and W.S.W., and $1\frac{1}{2}$ miles broad, and has some smaller islands and rocks off its western end. Its south-west shore is a little more than half a mile northward of Crib island, and the passage between them is divided, by a group of islets lying in the centre, into two passages, that to the northward named Trainer, and that to the southward Philips passage.

Marsden islands are a group of five islets lying eastward of the two passages; southward of them, towards Spiller passage, are several other islets and rocks; but north-west and north of them there is a clear channel to the north-east leading into Joe cove (Eden island) and Misty passage, and thence northward through Blunden and Old passages, on either side of Insect island, into Fife sound, south of the Benjamin group. These passages are, however, very narrow, and shoal in places, and are not navigable except by small coasters.

Tracey island, $1\frac{1}{2}$ miles long, and three-quarters of a mile wide in its broadest part, lies between the east ends of Eden and Mars islands. Between it and Eden island is Misty passage. Monday anchorage, between Tracey island and Mars island, is a sheltered position affording secure anchorage midway between the shores of the above islands in about 8 fathoms.

Baker island, forming part of the southern shore of Fife sound and the western side of Cramer passage, is situated eastward of Eden island, the triangular-shaped island named Insect lying between them. It is 1,385 feet high, $4\frac{1}{2}$ miles long E.N.E. and W.S.W., and $1\frac{1}{2}$ miles broad.

FIFE SOUND, bounded on the north by Broughton island, and on the south by Eden, Insect, and Baker islands, and the Benjamin group lying to the northward of them, and leading from Queen Charlotte sound to Suttlej and Tribune channels and Kingcome inlet, extends in a general N.E. and E.N.E. direction for 8 miles, when the Burdwood group divides it into two channels (Raleigh and Hornet passages) leading into Tribune channel; it has an average breadth of over one mile.

Fife sound, between Pearce peninsula and the Burdwood group, at 8 miles from its entrance, turns suddenly to the westward and joins Penphrase passage, which connects it with Sutlej channel and Kingcome inlet.

The entrance from Queen Charlotte sound, between Duff island (south shore) and the entrance to Cullen harbour (north shore), may be boldly steered for, passing at about half a mile south-east of Gore rock (4 feet high), which lies about one mile westward of the entrance.

Foster island, the summit of which forms a remarkable cone about 270 feet high, lies about 5 miles S.W. by S. from the entrance of Fife sound. Off its south side are the Twin islets (65 feet high), and off the north side is a patch of kelp, which may possibly overlie a rocky danger. The Twin islets lie $2\frac{1}{2}$ miles N.N.E. $\frac{1}{2}$ E. from Lizard point, the north-east entrance point of Trinity bay (Malcolm island). The channel between is named George passage.

Penfold island, 65 feet high, covered with trees, and small, lies $1\frac{1}{2}$ miles eastward of Foster island; the channel between Foster and Penfold has not been examined.

Holford islands, lying 2 miles N. by E. from Foster island, consist of two small islands, covered with trees, the tops of which are from 160 to 200 feet high. From the western island, a reef which uncovers 3 feet at low water, extends one-third of a mile westward, and the islands in this direction should be given a berth of one mile. Salmon channel is between Foster island and Holford islands, in which a mid-channel course should be kept.

CULLEN HARBOUR, on the south side of Broughton island, at the entrance to Fife sound, extends about 7 cables in a N.N.W. direction. Its entrance between Nelly island and the shore westward of Gordon point is less than one cable wide, and, when entering, care should be taken to keep exactly in mid-channel. Inside, the harbour opens out to 3 cables wide, with depths of from 4 to 8 fathoms.*

At the head of the harbour, on the west side, a narrow boat passage, through which the tide runs with great strength, leads into Booker lagoon.

* See Plan of Cullen harbour on Admiralty chart, No. 571; scale, $m = 6$ inches.

Anchorage may be had, well sheltered, in 5 fathoms, sandy bottom, at $1\frac{1}{2}$ cables S. by E. from Davidson island at the head of the harbour.

Tides.—It is high water, full and change, in Cullen harbour at noon ; springs rise 16 feet, neaps $11\frac{1}{2}$ feet.

Deep harbour, on the north side of Fife sound, 7 miles within the entrance, is formed by a narrow inlet in Pearse peninsula. At its entrance is Jumper island, 2 cables eastward of which, and just north of two small islets, is a reef, leaving a clear passage, 2 cables wide, along the north shore. The depths in the harbour vary from 14 to 37 fathoms ; but anchorage may be found off a small bight on the south shore, in 18 fathoms, at 3 cables south-westward of the narrow entrance to the bight which forms the head of the harbour.

Benjamin group, consisting of three islands and several smaller islets and rocks, lie off the south shore of Fife inlet, opposite Deep harbour. Indian passage, the narrow channel lying between them and the south shore, has a shoal patch of $1\frac{1}{2}$ fathoms in it, and though otherwise apparently clear of danger, should not be attempted.

Rugged island, lying $1\frac{1}{2}$ miles eastward of Gull rock (at the eastern extreme of the Benjamin group), has a rocky patch extending $1\frac{1}{2}$ cables from its north-west side.

Pym rock, which uncovers 2 feet at low water, and is steep-to, is a dangerous patch lying in the way of vessels entering Cramer passage.

Viner sound, on the south-eastern shore of Fife sound, about 3 miles north-east of Rugged island, gradually narrows from one mile at the entrance to 2 cables wide at the head, from which a bank, drying at low water, extends half a mile. Anchorage may be had in 10 fathoms at about three-quarters of a mile from its head, abreast an old Indian village.

Burdwood group lies off the entrance to Viner sound. The largest, which is the north-western one, is 700 feet high. Do not pass between them.

It is high water, full and change, in Viner sound at 1h. 0m. springs rise 15 feet, neaps 10 feet.

Simoom sound, the entrance to which is $1\frac{1}{2}$ miles N.W. from the Burdwood group between Deep Sea bluff on the east, and Pollard point on the west, extends $1\frac{1}{2}$ miles N.N.E. and then turns suddenly to West, which direction it maintains for nearly 2 miles as far as Curtis point, where the width decreases from half a mile to 2 cables, and the inlet bends to the south-west, expanding to a width of half a mile at its head, which is only separated by a narrow neck of land from 120 to 150 feet wide from Shawl bay, an indentation on the east side of Suttlej channel, and forming Wishart peninsula.

The width of Simoom sound at the entrance is one-third of a mile, and on the eastern side, one mile from Deep Sea bluff, is the small islet Lonisa. The water is deep, but where the sound turns to the westward it shoals to 40 and gradually to 20 fathoms, and south-westward of Curtis point in O'Brien bay, decreases to 11 fathoms.

Raleigh passage, northward of the Burdwood group, connects Tribune channel with Fife sound and Suttlej channel; there is also a passage to the southward of the group called Hornet passage. There is deep water in both these passages, but the former is the wider and the more direct.

TRIBUNE CHANNEL extends in a north-east direction for 10 miles; it then takes a south-easterly and easterly direction for 5 miles to the entrance of Thompson sound; thence it turns to the southward for 7 miles, communicating with Knight inlet (*see* page 273).

Kwatsi bay, on the north shore of Tribune channel, about 8 miles eastward of the Burdwood group, indents the coast for about 2 miles in a northerly direction. The water in the southern part is very deep, but shoals at half a mile from the head of the bay to 28 fathoms, and gradually to 13 fathoms.

Wah ka na bay, on the south shore, opposite to Kwatsi bay, indents the shore of Gilford island in a south-westerly direction for nearly 2 miles, varying from 2 to 4 cables in width; the depth at about one mile within the entrance being 32 fathoms, and near the head 18 fathoms.

Bond sound, which indents the north shore, extends 3 miles, and has an average width of nearly one mile. Owing to the great depth of water, it affords no anchorage, there being 30 fathoms close

alongside the mud bank at its head, through which some streams enter the sound.

Thompson sound, 6 miles south-eastward of Bond sound, extends in a north-east direction for 5 miles, its entrance being on the east shore opposite Trafford point, where Tribune channel turns to the southward. At the head of the sound is Sackville island, and the Kakweiken river flows into the sound northward of it. Between Sackville island and the mud flat off the river, the depths shoal, but rather steeply; anchorage, however, might with ease be picked up in the north-east corner, in 12 fathoms.

Humphrey rock, with 3 fathoms water on it, lies nearly in the centre of the southern part of Tribune channel, abreast Bamber point, the west salient point of Viscount island, and 2 miles to the northward of the north-east point of Shewell island.

Gilford island, the largest of the islands forming the archipelago on the eastern shore of Queen Charlotte sound, is $18\frac{1}{2}$ miles long in a north-east and south-west direction, and 11 miles wide at its north-east end, gradually decreasing to 2 miles near its south-west extreme (Bare hill). Gilford island is considerably elevated, the highest parts being near the north-east end, where mount Read rises to a height of 4,820 feet; mount James, near the centre, is 2,676 feet high. The south-west part of the island, however, is not so lofty, the hills over Bare hill point not being more than 925 feet high; but round its eastern, southern, and northern shores mountains ranging from 2,600 to 1,500 feet high rise almost precipitously from the coast.

Evangeline rock, which dries at low water, lies about $1\frac{1}{2}$ cables W.N.W. from White point on the north-west side of the island.

BROUGHTON ISLAND, which forms the north-west shore of Fife sound, and the southern and western shore of Suttlej channel, is 15 miles long in an east and west direction, and 6 miles wide at its western end, gradually tapering to one mile wide at its eastern extreme. The island is much indented, the largest inlet, Greenway sound, nearly separating the island into two parts; and a canoe passage also leads from Greenway sound to Carter bay, at the west point of the island, thus detaching the northern part of Broughton island, which is, therefore, really another island. The hills on Broughton island are not so lofty as those of the mainland contiguous

to it, the highest peaks being mount Browne, 1,745 feet, on the north shore of Greenway sound, and Quoin or Stoney mountain, 1,500 feet high over the entrance to Deep harbour; the remaining hill ranges varying from 600 to 1,000 feet in height.

Dobbin bay and Cockatrice bay afford no anchorage.

Polkinghorne islands lie off the coast at the entrance to Wells pass; the largest island, 190 feet high, being over one mile in length in a N.W. and S.E. direction, but only about 2 cables wide, and is distant from Broughton island $1\frac{1}{2}$ miles. Foul ground extends for some distance from the east side of this group, and it should not be approached within a distance of half a mile.

Caution.—Vessels passing between the Polkinghorne islands, Vincent, and Percy islands, should do so with great caution, and should not attempt to pass between the latter island and Dickson island.

Carter bay is formed between Dickson island and Broughton island, on the east shore of Wells pass; the water in it is deep.

WELLS PASS is the entrance to Suttlej channel from Queen Charlotte sound. From the entrance between Boyles point and Percy island, the pass extends 5 miles in a N.N.E. direction to its junction with Patrick passage, Grappler sound, and Drury inlet. The width at the southern part, between Dickson island and Popplewell point, is only half a mile, widening gradually to one mile at the northern end.

Ommaney islet, about 120 feet high, is the westernmost of the islets lying in Wells pass; its south and south-east sides are surrounded by kelp to a distance of about 2 cables, amongst which are rocks drying at low water. The passage into Wells pass is westward of Ommaney islet, which narrows the navigable channel to a width of 4 cables. When entering Wells pass and approaching Ommaney islet, keep the highest peak of Numas islands (lying off the entrance) just open of Boyles point until Ommaney islet is well shut in under Dickson island; whence steer to pass in mid-channel between the islet and James point.

SUTLEJ CHANNEL from its entrance (Wells pass) takes a N.N.E. direction for nearly 5 miles, varying from three-quarters to

one mile in breadth. At that distance it turns to the eastward through Patrick passage between Atkinson and Kinnaird islands, and thence south-eastward for 6 miles to the entrance to Greenway sound, whence it takes a general E.S.E. direction through Pasley and Sharp passages (on either side of the Stackhouse island), to its junction with Penphrase passage (*see* page 289) and Kingcome inlet. It is a deep channel throughout, and there is no known impediment to safe navigation by maintaining a mid-channel course.

TRACEY HARBOUR, on the eastern shore of Suttlej channel (Broughton island), nearly 3 miles within Wells pass, is at its entrance between Lambert island (on the north) and Mauve islet, 4 cables wide, but it soon narrows from $2\frac{1}{2}$ to $1\frac{1}{2}$ cables, maintaining that width for a little over one mile in an east direction; the harbour then opens out and forms two bights at its head, Napier bay, the northern, being $2\frac{1}{2}$ cables broad. The only known danger is the reef skirting Star rock (which lies on the north shore about half-way through the narrow portion of the harbour).*

Anchorage, completely sheltered, may be obtained in from 6 to 7 fathoms in Napier bay, or abreast Freshwater cove, at about 2 cables E.S.E. of Star rock, in 10 fathoms, mud bottom.

Tides.—It is high water, full and change, in Tracey harbour at noon; springs rise 16 feet, neaps rise $11\frac{1}{2}$ feet.

Lambert island, on the north side of the entrance to Tracey harbour, is $2\frac{1}{2}$ cables long and 2 cables wide, and 350 feet high; immediately to the eastward of it is Wolf cove, extending 4 cables in a north-easterly direction with a width of 2 cables at the entrance, gradually narrowing to one cable; it, however, affords no anchorage.

Atkinson island, 715 feet high, lies close off the north-west shore of Broughton island, at 2 miles northward of the entrance to Tracey harbour; some islets extend off its south-west point. Do not attempt to pass between it and Broughton island.

Surgeon islands, a group of small islets close together, lie half a mile West of Atkinson island at the entrance to Patrick passage.

Kinnaird island, 680 feet high and $1\frac{1}{4}$ miles long, lies on the east side of Grappler sound, with Dunsany passage on the east and Patrick passage on the south.

* *See* plan of Tracey harbour on Admiralty chart, No. 571; scale, $m = 6.0$ inches.

Greenway sound, on the south shore of Suttlej channel, 5 miles eastward of Patrick passage, has deep water throughout its entire extent, and affords no anchorage; inside its entrance are Cecil and Mande islets, 180 and 150 feet high.

CYPRESS HARBOUR, in Sharp passage, $2\frac{1}{2}$ miles eastward of the entrance to Greenway sound, extends about one mile south; the upper half, however, is both narrow and shallow. The entrance between Donald head (on the east side) and Woods point is 2 cables wide, but the navigable channel is only a little over one cable wide; the harbour then opens, and is from 2 to 4 cables across, the depths varying from 19 fathoms in mid-channel to 6 fathoms abreast Berry cove.^o

Fox rock, awash at high water, lies in the entrance, and is the outer part of a reef which extends one cable East from Woods point.

Anchorage.—Good anchorage may be obtained on the west side 4 cables from Woods point in 6 fathoms, mud bottom, off Berry cove, at one cable N.E. by N. from Tree islet. The land southward of the anchorage, between the head of Berry cove and Roffey point, is fringed with large cypress trees. A stream of fresh water flows into Berry cove.

Tides.—It is high water, full and change, in Cypress harbour at noon; springs rise 16 feet, neaps $11\frac{1}{2}$ feet.

Stackhouse island, 690 feet high, is about half a mile in extent, and lies in the middle of Suttlej channel abreast the entrance to Cypress harbour. Sharp passage to the southward of it, and Pasley passage to the northward, are both half a mile wide.

Magin islands, three small islands from 120 to 180 feet high, lie one mile northward of Stackhouse island, and half a mile from the west shore, a small rock, awash at high water, lying between.

Tidal streams in Suttlej channel run at the rate of from one to 3 knots.

KINGCOME INLET, at its entrance, is 2 miles wide, but the navigable channel between the Magin islands (lying off the west shore) and Bradley point (the west point of Gregory island) is contracted to $1\frac{1}{2}$ miles in width. Its termination on the northern

* See plan of Cypress harbour, on Admiralty chart, No. 571; scale, $m = 6.0$ inches.

shore is a low marshy plain, dotted with patches of scrub and stunted trees, and bordered by a flat of soft mud and sand $1\frac{1}{2}$ miles wide, which extends half a mile from the shore. This flat is steep-to.

The northern shores of this inlet are bordered by snow-clad peaks of 5,000 to 6,000 feet in height, which are conspicuous from Queen Charlotte sound; the southern shore is not quite so lofty, the range varying from 3,000 to 4,000 feet. Kingcome mountains, 5,600 feet high, rise over the head of this inlet, being 2 miles inland in an easterly direction.

Anchorage.—Kingcome inlet, in regard to the great depth of water, presents the same features as most of the chasm-like fiords on this coast. Anchorage, however, may be obtained in 18 fathoms, off a small cove, near two small bights, at $1\frac{1}{2}$ miles S.S.E. of the head of the inlet.

Wakeman sound, on the northern shore of Kingcome inlet, branches off N.N.W. at 6 miles from the entrance, in which direction it extends for a distance of 5 miles, terminating in a low marshy plain, dotted with patches of scrub and stunted trees, through which several streams flow, bringing down from the high ranges inland the melting snow, and causing the water for one mile from the head of the sound to be perfectly fresh at low water, and of a dull milky colour. At its head is an Indian village. The water is too deep for anchorage.

Belleisle sound, on the south shore of Kingcome inlet, at 3 miles E.S.E. from the entrance to Wakeman sound, has its entrance through a narrow pass which lies south of the small Edmond islands. The inlet takes a S.E. direction for about one mile, and then suddenly turns to the S.W. for a further distance of 3 miles; it, however, from its great depth of water, affords no anchorage.

Penphrase passage, connecting Suttlej channel and Kingcome inlet with Fife sound and Tribune channel, is about $2\frac{1}{2}$ miles long E. by N., and W. by S. The west entrance between Hayes and Vigis points is one mile wide, but the width of the passage decreases to $2\frac{1}{2}$ cables abreast of Trivett island. About one cable East from Trivett island is a shoal patch of 3 fathoms.

See chart, No. 581.

Nicholls island lies just inside the west entrance on the south side of the channel. A rock awash at low water lies $1\frac{1}{2}$ cables westward of the west point of Nicholls island.

DRURY INLET.—Between Pandora head and the shore to the southward is the entrance to Drury inlet, which is here only one cable wide, with a depth of 15 fathoms in it; just outside (eastward) the entrance is Morris island, which should be passed on the north side, and the northern shore should be closed to avoid a reef (marked by kelp in the season) lying on the south shore, half-way between Morris island and the narrowest part of the entrance.

Over the greater part of Drury inlet the depth is less than 25 fathoms, and it is nowhere so deep as most of these inland channels; in width it varies from one cable to one mile, the latter being its width throughout the greater part of the inlet; but at one place, Stuart narrows, $1\frac{1}{4}$ miles within the entrance, two islets (each connected to the shore by reefs) leave a passage of only $1\frac{1}{2}$ cables between them, and this is further obstructed by a dangerous rock, which uncovers 5 feet at low water, lying directly in the fairway between the two islets. Through these narrows the tidal streams during springs attain a velocity of 5 knots an hour.

Passing up Drury inlet, the shores of which have an average height of less than 1,000 feet, at one mile from Stuart narrows, Leche island is seen lying in mid-channel, and may be passed on either side; here the inlet opens out to the southward, forming Richmond bay, in which are several islets. At a little over one mile westward of Leche island is Ligar island, 150 feet high, having at one cable east of its south point a dangerous sunken rock, uncovering 5 feet at low-water springs.

Voak rock, another dangerous rock, awash at low-water spring tides, lies 3 cables N.N.W. $\frac{1}{2}$ W. from Ligar island, with deep water between.

Sir Everard islands, on the south shore, $1\frac{1}{2}$ miles westward of Ligar island, form a chain extending in a N.W. direction, with rocks between them, a clear channel lying between them and Hooper island to the northward.

Blount rock, 3 feet above high water, lies close to the south shore half a mile to the westward of Sir Everard islands.

Jennis bay, on the north shore, abreast the Sir Everard islands, would afford anchorage for a small vessel; when entering, pass eastward of Hooper island lying at the entrance, and anchor in the centre of the bay in 7 to 10 fathoms.

Centre rock, a dangerous sunken rock, uncovering 8 feet at low-water springs, lies in the middle of Drury inlet $1\frac{1}{10}$ miles West of the northern of the Sir Everard islands; it is steep-to around, and vessels will clear it by keeping at 2 cables from either shore.

Muirhead islands.—At $2\frac{1}{4}$ miles westward of Centre rock, the inlet becomes studded with small islands, having deep channels between them, and extending over a distance of 2 miles. The easternmost of these is Wilson island, 120 feet high; Keith island, also 120 feet high, lies 2 cables westward of it, and the Muirhead islands, three in number, extending one mile in an east and west direction, are situated one cable westward of the latter. The west Muirhead island is the largest and 255 feet high.

Between this group and the south shore the space is occupied by numerous small islands, but there is a clear channel along the north side of the group; westward of these, however, the water shoals rapidly, there being only 2 to 3 fathoms in Sutherland bay at the head of Drury inlet. A densely wooded valley extends across the peninsula in a south-west direction to the outer coast of Queen Charlotte sound.

Actæon sound, which branches off from the north side of Drury inlet abreast the west Muirhead island, is so blocked at its entrance by islets and rocks as to render it only available to boats.

GRAPPLER SOUND.—West of Patrick passage between Kinnaird island and Pandora head, is the entrance to another inlet which continues in a northerly direction for four miles, and is known as Grappler sound. From it several smaller bights branch off on both sides, those on the east communicating with Hopetown and Kenneth passages, north and south of Watson island. The depths in the sound range from 20 to 30 fathoms, but are shoaler in Claydon and Carriden bays on the west shore. At the entrance to the former a reef lies nearly in mid-channel, and a reef also extends $1\frac{1}{2}$ cables from Linlithgow point, on the north shore of the entrance to the latter.

See chart, No. 581.

Buckingham, Hammersley, and Hanbury islands lie on the north side of Kinnaird island at the entrance to Hopetown passage, the first being the largest and 300 feet high.

Dunsany passage, leading from Grappler sound to the entrance to Hopetown passage and south-eastward into Sutlej channel, east of Kinnaird island, is apparently clear of dangers, with the exception of a reef, which covers at high water springs, lying off the north shore at the entrance to Hopetown passage.

Hopetown passage can only be used by boats, which can pass the barrier of rocks (that extend right across the passage at $1\frac{3}{4}$ miles from the entrance) at high water, and can thence proceed into Mackenzie sound.

Kenneth passage, leading from the head of Grappler sound round the north side of Watson island, is $3\frac{1}{2}$ miles long, and communicates with Mackenzie sound at its junction with Hopetown passage. About one mile from its entrance (which is only a little over one cable broad) from Grappler sound it widens considerably, a bight, named Turnbull cove, extending one mile in a W.N.W. direction; but half a mile further eastward the passage contracts to 3 cables between Alexander and Tessie points, and thence several islands, islets and rocks obstruct the passage, rendering its navigation dangerous.

Mackenzie sound, from the east point of Watson island, extends 3 miles E.N.E., gradually narrowing towards its head at the foot of mount Stephens (5,665 feet high), where it becomes a mere chasm, and shoaling in the same direction from 25 to 10 fathoms.

BOYLES POINT, the western entrance point of Wells pass and the southern point of the peninsula formed by Drury inlet, has three small islets lying close off it, the outer of which is only 4 feet above high water. Over and on each side of the point are undulating hills of about 500 feet high, rising gradually inland to mount Wynyard (about 1,200 feet high).

Boyles point is situated in latitude $50^{\circ} 48' 50''$ N., longitude $127^{\circ} 1' 40''$ W.

Lewis rocks, a small cluster, 4 feet to 30 feet above high water, lie one mile W.S.W. from Boyles point, with rocks awash and foul ground extending 7 cables southward from them.

Numas islands, the largest of which is $1\frac{1}{2}$ miles long east and west, lie 4 miles S.S.W. from Boyles point; the largest is 434 feet high, and off its western extreme is Staples islet, 24 feet high. These form an excellent landmark. Labouchere channel, between Numas islands and the Lewis rocks, is over 2 miles wide. The tidal streams run at the rate of from one to 3 knots through this channel.

Rayner group consists of four or five small islands, 120 to 150 feet high, lying close to the shore eastward of Blunden harbour. The southern edge of the group is fringed with sunken rocks, and they should not be approached in that direction nearer than half a mile. Masses of kelp surround these islands in the season, and skirt the shore towards Blunden harbour.

Gillot rock, 2 feet above high water, is the easternmost of the dangers lying to the southward of the Rayner group.

Black rock, 7 feet above high-water springs, is the westernmost of the dangers in the vicinity of Rayner group.

BLUNDEN HARBOUR, on the north shore of Queen Charlotte sound, 12 miles westward of Wells pass, is formed between several islands. The entrance between Shelf point, the east extreme of Robinson island (120 feet high), and Barren rock, a small rock 12 feet high, is $2\frac{1}{2}$ cables wide; but a reef (marked by kelp) extends $1\frac{1}{4}$ cables South from the latter, and another reef extends the same distance E.N.E. from Burgess island (100 feet high), a small island lying close to the shore $3\frac{1}{2}$ cables S.S.W. from Shelf point, thus rendering the channel somewhat tortuous.*

Anchorage may be obtained in 4 fathoms, mud bottom, in the western part of the harbour, at 2 cables S.W. of the southern of the two Bonwick islands, which are joined to the shore and to each other at low water.

Directions.—When entering Blunden harbour, which is only available for vessels of moderate size, bring Shelf point to bear N.W. $\frac{3}{4}$ N., when it will be just open of Charles point (on the east shore), and steer in on these marks and keep in mid-channel.

Tides.—It is high water, full and change, in Blunden harbour at noon; springs rise 16 feet, neaps rise $11\frac{1}{2}$ feet.

* See plan of Blunden harbour on Admiralty chart, No. 571; scale, $m = 6$ inches.

Browning islands, $2\frac{1}{2}$ miles W.S.W. from the entrance to Blunden harbour, are a small group, the largest being $2\frac{1}{2}$ cables long and about 200 feet high. A dangerous rock, which dries 3 feet at low-water springs, lies 3 cables E.S.E. from the east extreme of the largest of the Browning islands; therefore, give those islands a berth of one mile when passing.

Stuart point, $1\frac{3}{4}$ miles W. by N. from the Browning islands, has some rocky islets off it; and 3 cables E. $\frac{1}{2}$ S. from Stuart point, in the centre of a bay between the point and Browning islands, is a patch of 2 fathoms.

Leading hill, 570 feet high, is situated close over the coast $1\frac{1}{2}$ miles W. by N. $\frac{1}{2}$ N. from Stuart point. Robertson and Jeanette islands, the latter 100 feet high, lie close off the shore under Leading hill. Round island, a little over half a cable in extent, the tops of the trees being 100 feet above the water, lies 6 cables S. by W. from Jeanette island.

Millar group consists of a chain of small islands extending over 2 miles W. by N. $\frac{1}{2}$ N. and E. by S. $\frac{1}{2}$ S. at 4 cables southward of Round island, between which and the group vessels should not pass. The tops of the trees on the highest island of the group are from 150 to 200 feet above the sea.

At 3 cables W. by N. $\frac{1}{2}$ N. from the western island of the group is David rock with 12 feet water on it.

Mary rock, a dangerous rock lying 8 cables S.E. by E. $\frac{1}{2}$ E. from the south end of the Millar group, is, however, generally visible, it being awash at high water. When passing through North channel from the south-eastward, approach it with Round island bearing W. by N., and do not bring the island to bear northward of that bearing until the east end of the Millar group bears W.S.W., when alter course for mid-channel between Round island and Jeanette island.

The Deserters islands are a group of islands, islets and rocks, the largest of which is nearly 2 miles in length, lying $1\frac{3}{4}$ miles southward of the Millar group. The Walker group (*see* page 308) is situated westward of the Deserters, separated from them by Shelter pass.

RIPPLE PASSAGE, between the Millar group and the Deserters islands, has several dangerous rocks in it, and should therefore not be used except in an emergency, and then only at low water (when nearly all the dangers show) and with the greatest caution.*

Sun rock, the most dangerous of these rocks, owing to its locality and only being apparent during bad weather, when the sea breaks on it, lies 8 cables S.W. $\frac{1}{2}$ W. from the westernmost islet of the Millar group.

Twin rocks, 10 feet above high water, are two small rocks lying 6 cables north-east of McLeod island. Heavy overfalls are met with northward and westward of the Twins. Richard islet, 25 feet above high water, and bare, lies 7 cables N.E. from the Twins; it should not be approached within one cable. Barry islet lies one mile S.E. by E. $\frac{1}{4}$ E. from Richard islet; it is bare, and 45 feet above high water. Echo islets, a small group lying 8 cables South of Barry islet, extend over half a mile N.W. and S.E. At 3 cables off their north-west end is George reef; it lies three-quarters of a mile S.W. from Barry islet.

NORTH CHANNEL into Queen Charlotte sound extends close along the shore of the mainland from Bremner island off Buccleuch point to between Jeanette island and the Millar group (above described), passing between White and Mayor islands on the north, and North rock on the south (*see* page 309), and at half a mile southward of Rogers, Dickenson, and Harris islets; thence past Bold bluff, and midway between Wentworth rock and Wallace islands.

To clear North rock, passing northward of it, keep Harris islet just open south of the south extreme of Jeanette island bearing E. by S. $\frac{1}{2}$ S.

Shelter bay trends easterly for nearly 2 miles, forming two bights at its head. The entrance between the Wallace islands and the shore to the northward is 4 cables wide, but the bay is encumbered with rocks in its most sheltered part, and could only be made use of as an anchorage by those possessing local knowledge. In a small bay north of Wallace islands there is good landing for boats, and there is also good landing for boats in south-easterly winds, in a bight 3 cables west of the point forming the north-west entrance to Shelter bay.

* *See* Admiralty chart:—Goletas channel to Quatsino sound, No. 582; scale, $m = 0.5$ of an inch.

Annie rocks, 16 feet above high water, are bare rocks, lying 3 cables off the coast $1\frac{1}{4}$ miles West of the entrance to Shelter bay.

Wentworth rock, 10 feet above high water, lies $1\frac{1}{2}$ miles S.W. $\frac{3}{4}$ W. from the Wallace islands; it should be given a berth of half a mile in all directions.

Southgate group lies close off the coast 3 miles westward of Shelter bay. Bold bluff, the south-east island of the group, has rocky patches off its east end. The shore of the mainland abreast Bold bluff falls back to the N.N.W. for a distance of 6 miles, the southern part being skirted by several small off-lying islets and rocks, extending 5 miles westward of this group, the positions of which are best seen by the chart.

Murray labyrinth is the name given to the many channels which lie between a group of several islands, islets, and rocks lying off the south coast of Branham island, 2 miles N.N.W. from the Southgate group.

Branham island, $3\frac{1}{2}$ miles long (east and west) and $2\frac{1}{2}$ miles broad, lies off the coast of the mainland, and together with the Fox islands forms the southern shore of Slingsby channel. Nina hill, on the south side of the island, is 500 feet high. Skull cove, indenting the island to the eastward of Nina hill, affords good shelter for boats.

Schooner passage, between the east shore of Branham island and the mainland, is a narrow pass having an average width of one cable in a N.N.W. direction for a distance of $2\frac{1}{2}$ miles; it is, however, at one place obstructed by a rock lying in mid-channel, which leaves a passage only 80 yards wide between it and the shore of Branham island. Schooner passage communicates with Slingsby channel, at one mile southward of the Nak wak to rapids.

The tidal streams in Schooner passage run at the rate of from 2 to 5 knots.

Mayor island, a small wooded island, $1\frac{1}{2}$ cables in extent, and 90 feet high, lies $1\frac{2}{3}$ miles W.N.W. from the Emily group. A rock awash at low water lies 2 cables East from it.

White island, small, bare, and 48 feet high, lies $1\frac{1}{2}$ miles W. by N. $\frac{1}{4}$ N. from Mayor island. Morphy rock, which covers at three-quarters flood, lies 6 cables N.E. by E. $\frac{1}{2}$ E. from White island, and $3\frac{1}{2}$ cables S. by W. $\frac{1}{4}$ W. from McEwan point, the south-west extreme of Branham island.

Fox islands, the western of which, 375 feet high, is $1\frac{1}{2}$ miles long (north-east and south-west), and the eastern half a mile long, lie off the western end of Branham island, and form the south shore of the outer part of Slingsby channel.

SLINGSBY CHANNEL, on the northern shore of Queen Charlotte sound, 7 miles south-eastward of cape Caution, leading to Seymour and Belize inlets, is 5 miles in length N.E. by E. $\frac{1}{2}$ E., with an average breadth of 3 cables, between Outer narrows and Nak wak to rapids.

It is high water, full and change, in Slingsby channel at 2h. 20m. ; springs rise 11 feet, neaps range 5 feet.

Outer narrows.—At three-quarters of a mile within the entrance (between Dalkeith and Lascelles points) the channel contracts to only one cable in width, with no bottom at 40 fathoms. With the wind blowing in, *i.e.*, between West and South, the sea breaks across the entrance, and in the narrowest part, even during calms, the water is much agitated.

Tidal streams.—In these narrows the flood stream runs $2\frac{1}{2}$ hours after high water by the shore ; at springs the velocity is from 5 to 9 knots, at neaps from 4 to 6 knots, the change of stream occurring after only about 15 minutes slack water. The ebb stream runs $2\frac{1}{2}$ hours after low water by the shore, attaining, at springs, a velocity of 10 knots, and at neaps from 5 to 7 knots.

Nak wak to rapids (Kah tsis illa), at the eastern end of Slingsby channel (communicating with Seymour inlet), are 2 cables wide, but in the centre of the rapids is Turret island, 80 feet high, against which the tide rushes with great fury. The channel westward of Turret islet has a rock in it with only 2 fathoms water on it ; that to the eastward has depths of from 6 to 11 fathoms.

The flood stream commences $2\frac{1}{2}$ hours after low water by the shore in Slingsby channel (*see above*), and runs (with a velocity at springs

of 12 to 15 knots) from 2 to 2½ hours after high water, or until it is high water at Seymour inlet; after an interval of 10 minutes slack water the ebb commences and runs until 2 to 3 hours after low water in Slingsby channel, attended by very heavy and dangerous overfalls, and attaining a velocity at springs of 20 knots.

Directions.—Steam-vessels may enter Slingsby channel from the westward through the Outer narrows in fine weather, at or near slack water, and proceed to Treadwell bay, 4 miles within the entrance on the north shore, where anchorage will be found in from 9 to 15 fathoms, avoiding the shoal of 2½ fathoms situated southwards of the centre of the bay.

If it be necessary to proceed through Nak wak to rapids, the turn of the stream should be most carefully watched, so that the vessel may with certainty make the passage during the only 10 minutes of slack water, for at no other time would it be possible to do so with any degree of safety.

These narrows, however, should only be used by a vessel on emergency and after acquiring some practical knowledge, by passing through at slack water in a boat. It is also imperative that the tides should be previously watched from Treadwell bay.

Small canoes pass from Slingsby channel into Seymour inlet at half tide through a very narrow passage on the north shore inside the small island forming the north point of the narrows.

Treadwell bay, on the north shore of Slingsby channel, is formed by the channel widening to 8½ cables and forming a bight in which lie the Anchor islands (a group consisting of several islands), leaving a sheltered space 2½ cables in extent between the north coast of the largest island and the shore. The largest Anchor island is half a mile long east and west, and 220 feet high. The depth of water in the bay varies from 7 to 12 fathoms, but near the centre, rather over to the south side, there is a shoal spot with from 4 to 2½-fathoms on it. The bay affords shelter free from tidal streams. Large ships should moor.

Entering Treadwell bay, give the south-eastern Anchor islands (Current point) a berth of 1½ cables, and having rounded them, keep the shore of the mainland aboard.

Anchor as convenient in 10 to 12 fathoms northward of the $2\frac{1}{2}$ fathoms patch, before mentioned.

It is high water, full and change, in Treadwell bay at 0h. 30m. ; springs rise 11 feet, neaps 5 feet.

Caution rock, which uncovers (6 feet) at low-water springs, is a dangerous rock lying in the fairway south-eastward of the Anchor islands, and $1\frac{1}{2}$ cables from the south shore of Slingsby channel. To avoid it, keep the south shore aboard at less than one cable distant.

NUGENT SOUND.—From Nak wak to rapids a branch half a mile wide trends E.S.E. about one mile ; here it divides into two, one branch continuing E.S.E., and the other (Nugent sound) E.N.E. for 11 miles. Nugent sound in some places is only 2 cables across, but it has deep water throughout, and is navigable, though there is no anchorage in it.*

SEYMOUR INLET.—The other branch, from Margaret point at the entrance to Nugent sound, trends E.S.E. for 6 miles, with deep water in mid-channel. On the north shore is Charlotte bay, and on the south Ellis bay, both, however, unavailable as an anchorage. At the above distance, on the north shore, is the entrance to Seymour inlet, several islets lying just within it. A narrow pass of shallower water with depths of 4 and 10 fathoms continues for 3 miles E.S.E. Wa wattle bay lies between the entrances to these two arms, and extends one mile E.N.E. with depths of from 23 to 18 fathoms.

Seymour inlet, from its entrance to the head of Salmon arm, is 25 miles long, varying from three-quarters to $1\frac{1}{2}$ miles in width, and maintains a depth of over 40 fathoms throughout to within 2 or 3 cables of the shore at its head. There are several indentations on both shores, the largest being Maunsell bay on the north shore ; none, however, afford an anchorage.

At 3 miles eastward of Maunsell bay are Eclipse narrows, where the tidal streams run with great strength, and no bottom could be obtained at 12 fathoms ; these narrows lead to Salmon arm and Frederick sound, the latter extending 5 miles S.E., the former 3 miles N.E.

*See Admiralty charts :—Johnstone and Broughton straits, No. 581 ; scale, $m = 0\cdot5$ of an inch ; also Vancouver island, No. 1,917 ; scale, $m = 0\cdot15$ of an inch.

Salmon arm terminates at the foot of Perpendicular mountain, 5,000 feet high. Ta altz, an Indian winter village, is situated on the shore at its head.

The continuation of Seymour inlet northward of Eclipse narrows terminates at 6 miles, a river flowing into it at its head, on which is situated a winter village of the Wa watl Indians.

BELIZE INLET.—From Nak wak to rapids, another branch, 3 cables wide, takes a westerly direction for 3 miles to Mignon point, where it suddenly turns E.N.E. for 24 miles, with an average width of half a mile, and with deep water throughout; it lies between high ranges, 3,000 to 4,000 feet high. From the head of Belize inlet to Maunsell bay, on the northern side of Seymour inlet, there is, according to Indian reports, a portage about $2\frac{1}{2}$ miles long.*

Lassiter bay, at the head of the continuation of the inlet, between Harvell and Mignon points in a westerly direction, forms two small bights, with some few islets and rocks in it, but the water is inconveniently deep for anchorage.

Mereworth sound.—At 5 miles eastward of Mignon point, on the north shore, is the entrance to Mereworth sound, another similar inlet branching off to the northward, in which direction it continues for 4 miles, and then suddenly turning to the eastward for 6 miles, maintaining deep water throughout. Flat rock, Square and Round islands, lie on the west shore at the entrance to Mereworth sound, with deep water around.

Strachan bay, at $1\frac{1}{2}$ miles from the entrance to Mereworth sound, on the western shore, is the entrance to a small inlet which takes a westerly direction for $1\frac{1}{2}$ miles, and has depths of 40 to 16 fathoms. Village bay, on the opposite shore, abreast Strachan bay, is a small bay with two islets off its north point, and depths of 19 to 22 fathoms in it. Westerman bay is a small bight $1\frac{1}{2}$ miles long in a northerly direction, with from 30 to 20 fathoms water over it, except at its head, where it suddenly shoals to $3\frac{1}{2}$ fathoms at 4 cables from the shore. The entrance to Westerman bay is 2 miles westward of the entrance to Mereworth sound.

Alison sound.—At about 10 miles eastward from the entrance to Mereworth sound, on the north shore of Belize inlet, is the entrance to Alison sound, another narrow branch which, like

* See Admiralty chart :—Vancouver island, No. 1,917.

Mereworth sound, first takes a northerly direction (for 3 miles) and then suddenly turns eastward for 3 miles, finally turning again to the northward for a further distance of 2 miles, to its head. At about 2 miles from the entrance Alison sound is only about 350 yards wide; here, in the middle of the passage, is a small islet (Obstruction islet) having a passage on either side of it 150 yards wide, with a depth of 10 fathoms in it.

BREMNER ISLET, 58 feet high and covered with grass, lies $1\frac{1}{2}$ miles W. $\frac{1}{2}$ N. from Lascelles point, and half a mile distant from the shore.

GOLETAS CHANNEL, which runs along the north shore of Vancouver island, is 22 miles long east and west, with a breadth varying from one to $2\frac{1}{2}$ miles. Its shores are high, rugged, and steep-to, except in the western part, and may be generally approached to about a quarter of a mile; the northern side is composed of a group of islands (the principal of which are Galiano and Hope islands), mostly small, through which are several navigable passages.*

There are four anchorages in the channel, viz., Shushartie bay on the south side; port Alexander, Shadwell passage, and Bull harbour on the north side; and all, with the exception of the latter, are easily accessible to sailing-vessels.

Duval point, on the south side at the eastern entrance of the channel, is 15 miles West of Broughton strait, or in lat. $50^{\circ} 46' 10''$ N., long. $127^{\circ} 30' 0''$ W.

Navigable depths.—The depths throughout the channel to the west entrance are deep, varying from 190 to 80 fathoms, but there the bottom suddenly rises from 40 to 7 and 9, and in one part to less than 3 fathoms, forming Nahwhitti bar, stretching completely across the channel, and in a great measure preventing any heavy sea rising inside it during westerly gales.

Tides and tidal streams.—It is high water, full and change, in the Goletas channel at 0h. 30m., and the rise and fall varies from 12 to 14 feet. The tidal streams in the east part of the channel run from one to 3 knots, but near the west entrance, in the vicinity of

* See Admiralty chart of West end of Vancouver island (Goletas channel to Quatsino sound), No. 582; scale, $m = 0.5$ of an inch; also Admiralty plan of Goletas channel, No. 555; scale, $m = 2$ inches.

the Nahwhitti bar, they are much stronger (2 to 5 knots), turning shortly after high and low water by the shore.

SHUSHARTIE BAY.—From Duval point the south shore of Goletas channel trends westward 15 miles to Shushartie bay. This bay is about half a mile in extent, and its shores are high, except at the head, from which a sandbank extends more than 2 cables. There is a very limited but fairly sheltered anchorage just inside the north-east point of the bay, in about 13 fathoms, at one cable off shore, but from the steepness of the bank it should only be considered as a stopping place.*

Dillon rock, which covers at a quarter flood lies $1\frac{1}{2}$ cables West from Halstead island, which lies close off the east point of the bay, and is in the way of vessels entering from the eastward.

Directions.—If entering Shushartie bay from the eastward, and Dillon rock be covered, do not steer in for the anchorage till the easternmost peak of the Shushartie saddle (a remarkable double-topped mountain 1,900 feet high situated south of the bay) is seen in the centre of the bay bearing S. $\frac{3}{4}$ E., when proceed in with that mark on, which leads westward of Dillon rock; when the north-east point of bay bears E. by N. $\frac{1}{2}$ N., the vessel will be clear south of it, and should steer for the eastern shore.

Entering from the westward keep the western shore aboard till Halstead island bears E. by N. $\frac{1}{2}$ N., when steer in as before directed.

Anchor immediately 14 fathoms are obtained, as the bank is steep which will be at about one cable off it, with the extremes of the bay bearing N.E. and N.W. by W.

Shingle point, 2 miles west of Shushartie bay, is low; a beach runs off it a short distance; westward of this point it is difficult to land, except in fair weather.

CAPE COMMERELL, 22 miles West of Duval point, is the northernmost point of Vancouver island, and the south point of the west entrance to Goletas channel. The cape is low, and some rocks extend off it for nearly 2 cables; eastward of it the coast forms a large bay 3 miles wide and about one mile deep, with from $2\frac{1}{2}$ to 6 fathoms rocky bottom, and not in any way adapted for anchoring. The shoal part of Nahwhitti bar, on which there is as little as

* See Admiralty plan of Shushartie bay, No. 2,067; scale, $m = 3$ inches.

2½ fathoms, extends north-westward from the east point of this bay ; it is marked by kelp and named Tatnall reefs. Weser islet 8 feet high lies in the western part of the bay, distant a quarter of a mile from the shore. There is an Indian village on the east side of the cape.

Cape Commerell is situated in latitude 50° 52' 35" N., longitude 128° 3' 0" W.

GORDON GROUP consists of a number of small islands extending in an east and west direction for 5 miles, and bordering the north part of the east entrance of Goletas channel. They are high and steep-to, and on the eastern or Doyle island is Miles cone, a remarkable hill 380 feet high. Their eastern extreme is 2 miles North of Duval point.

Duncan island, one mile South of the Gordon group, is about one mile in circumference, and 300 feet high.

Noble islets, 30 feet high, lie 1½ miles West from Duncan island, between which and the group it is not advisable for a large vessel to go.

Blyth islet, 20 feet high, lies 7 cables eastward of Noble islets ; and Mouatt rock with 7 feet over it lies 2½ cables N.N.W. of Blyth islet.

Balaklava island, 2½ miles long north-west and south-east, and from half a mile to one mile wide, and with three peaks, lies between the Gordon group and Galiano island, forming Christie and Browning passages. A small rock 4 feet high, surrounded by kelp, lies one cable South of the south-eastern Lucan islands. Raglan point, the north-west point of Balaklava island, has a ledge extending 2½ cables from it ; and half a mile N.W. from the point are the Cardigan rocks, 6 feet high, with Croker rock 1½ cables N.E. from them. These rocks are surrounded by kelp.

Christie passage, between the west side of the Gordon group and Balaklava island, is half a mile wide ; some shoal patches with from one to 3 fathoms on them lie 1¾ cables from the east shore of Balaklava island, and 6 to 7 cables S.E. by S. from Scarlett point ; between them and the island is George island. The tidal streams run from one to 3 knots through it, the flood to the southward.

If intending to go through this passage from Goletas channel, a large vessel should enter it westward of the Noble islets.

Browning passage, West of Balaklava island, between it and Galiano island, runs in a north-westerly direction. Its length is about 3 miles, its breadth in the narrowest part 2 cables, and a rock, which covers at three-quarters flood, lies on the west side of the channel about three-quarters of a cable from Galiano island. A reef and foul ground marked by kelp extends $1\frac{1}{2}$ cables from Balaklava island, just opposite the above-mentioned rock, and this is the narrowest part of the channel, which is deep. The tidal streams are weak in this channel.

GALIANO ISLAND, the largest of the islands on the north side of Goletas channel, is nearly 8 miles long, and $3\frac{1}{2}$ miles broad. Mount Lemon, a remarkable peak of conical shape 1,200 feet high, rises near its south-west part, and Magin saddle consisting of two peaks, 700 and 800 feet high, is situated at less than one mile from the west extreme of the island.

The south side of Galiano island is high, steep-to, and clifty; at $4\frac{1}{2}$ miles West from Boxer point is a small cove which would afford shelter to small craft from westerly winds.

Port Alexander, on the west side of Browning channel, in Galiano island, trends N.W. for $1\frac{1}{2}$ miles, with a general breadth of about 4 cables; there is a small islet in the middle of it, half a mile from the entrance, and another close off Boxer point on the west side of the entrance.

This port is easy of access to steamers and sailing-vessels with a fair wind, and affords good anchorage in 12 to 13 fathoms, at half a mile from its head, well sheltered from all except south-easterly winds.

SHADWELL PASSAGE, between Galiano and Hope islands, is $3\frac{1}{2}$ miles long in a northerly direction, and its breadth varies from a half to $1\frac{1}{2}$ miles; foul ground extends nearly half a mile from the shore between Turn point and cape James.

Shadwell passage may be used by steamers, or sailing-vessels with a fair wind; it would hardly be prudent to beat a large vessel through it, as there is generally a heavy swell and strong tide in the north part. It is the passage usually taken by small vessels when bound north from the inner waters. *See* Bate passage, page 305.

A vessel may anchor about 2 or 3 cables north-west of Centre island, sheltered from all except northerly winds. The tidal streams set from 2 to $4\frac{1}{2}$ knots.

Vansittart island is one mile long, and three-quarters of a mile wide, and 260 feet high; west of it are some rocks and small islets extending 6 cables off it; and half a mile from the north point are two wooded islets 70 feet high named Nicolas islands.

Willes island, 208 feet high, is at the south-east part of the passage close to Galiano island; a quarter of a mile S.E. of it is a small low islet, named Slave island.

Centre island, in the middle of the passage, and 5 cables S.W. from Vansittart island, is small; but there is a passage on either side of it; that to the westward, however, is much obstructed by Suwanee rock, which dries 4 feet at low-water spring tides, and lies one cable W. by S. $\frac{3}{4}$ S. from the high-water mark of Centre island, rendering the passage west of that island unsafe.

One Tree islet, 4 cables West of Vansittart, is small, about 40 feet high, and has a single tree on its summit, which is very conspicuous when seen from the northward, and of great use in identifying the passage; but between it and Vansittart island are rocks and foul ground. Breaker reef, the outer of the dangers extending N.W. from Vansittart island, lies half a mile N. by W. $\frac{3}{4}$ W. from One Tree islet.

Turn point lies 2 miles N.E. of Heath point about midway between it and cape James; it is backed by a hill 300 feet high.

Cape James, the north west extreme of Shadwell passage, 2 miles N.N.W. from Turn point, is a rocky bluff 90 feet high; some rocks extend off it to the southward for a short distance. The cape should at all times be given a berth of at least half a mile.

Tidal streams.—The flood stream runs to the southward through Shadwell passage at the rate of about $4\frac{1}{2}$ knots, whilst the ebb, in the northern part, sets 2 knots in the contrary direction; southward of Centre island, however, it runs as strong as the flood. Tide rips exist between Centre and Vansittart islands.

Bate passage, eastward of Vansittart island, is deeper, and perhaps for a sailing-ship or stranger it would be easier to navigate

than Shadwell passage; if proceeding through it, keep in mid-channel. Commanders of vessels that do not steer well are recommended to use Rate passage instead of Shadwell passage.

Hope island, the westernmost of the group which forms the north side of Goletas channel, is 6 miles long, east and west, and its greatest breadth is $3\frac{1}{4}$ miles; the sea breaks heavily along its north and west sides, and off Mexicana point (the western extreme) a reef extends 3 cables.

BULL HARBOUR is on the south side of Hope island, 2 miles from the western entrance of Goletas channel. Though small, this harbour affords a very secure landlocked anchorage. It runs northerly for $1\frac{1}{2}$ miles.*

Indian island, $1\frac{1}{2}$ cables North of the narrowest part of the entrance, is small, but completely shuts in the harbour, leaving a passage to it on the eastern side one cable wide; between the island and the west shore there is only a depth of 11 feet.

To enter Bull harbour, steer up in mid-channel, pass East of Indian island, and moor immediately the vessel is northward of it, anchors north and south. Only steamers or small sailing-vessels should use this anchorage. There is only room for one or two vessels of moderate size to lie moored.

Tides.—It is high water, at full and change, in Bull harbour at 0h. 30m.; springs rise $12\frac{1}{2}$ feet.

NAHWHITTI BAR, or ledge, stretching across the west entrance of the Goletas channel, is of sandstone formation, and on the eastern edge rises suddenly from 40 to 9 fathoms, the depth increasing very gradually to the westward. Its breadth within the 10-fathoms line is from one to nearly 3 miles, it being broadest at the south part, where are several shoal spots. On the western edge of the bar the tidal streams run from 2 to 5 knots. In heavy westerly gales the sea breaks across the Goletas channel at this bar.

Tatnall reefs, with $2\frac{1}{2}$ and $3\frac{1}{2}$ fathoms on them, lie on the bar $1\frac{1}{2}$ miles from the south shore; northward of these patches the depths vary from 6 to 9 fathoms.

Directions.—Bound westward through Goletas channel, steer in mid-channel, or within half a mile of either shore, until west of Bull

* See plan of Bull harbour on Admiralty chart, No. 2,067; scale, $m = 3$ inches.

harbour, after which keep Boxer point open of Lemon point bearing E. $\frac{1}{4}$ N., until Mexicana point bears N. by E., when a vessel will be westward of the Nahwhitti bar.

In a sailing-ship beating through the channel, keep south of Duncan and Noble islands; elsewhere, until west of Bull harbour, the shores on both sides may be approached to within a quarter of a mile; when standing southward, west of Bull harbour, tack when Shingle and Lemon points are in line bearing E. by N., and do not approach nearer than half a mile towards Mexicana point, as there is generally a heavy swell setting in on it, and the ground is uneven.

When crossing the bar in the deepest water, if the weather be clear, mount Lemon, a high conical peak, should appear nearly midway between Shingle point and Heath point on the opposite shore, or nothing to the southward of midway between them.

If obliged to anchor for the night, or tide, Shushartie bay, though small, is easy of access, the only danger being Dillon rock off its east point (*see* page 302). Port Alexander and Shadwell passage, along the north shore, are also, with a fair wind, easy of access to sailing-vessels, and the latter is preferable, being more roomy with better holding ground.

NEW CHANNEL, northward of Goletas channel, is about $12\frac{1}{2}$ miles long, and has a breadth varying from $1\frac{1}{2}$ to 4 miles.

Generally, a heavy swell sets through New channel from the westward, and, with the exception that there is more room for a large vessel to work in or out than in Goletas channel, there is no reason to use it in preference to the latter, unless, if running in before a heavy westerly gale, the sea were breaking across the west entrance of Goletas channel at the Nahwhitti bar.

Crane islets are 30 feet high, and steep-to, there being 100 fathoms one cable distant. They lie $2\frac{1}{2}$ miles westward of Doyle island, and about 3 cables north of Gordon group. Boyle island, $1\frac{1}{2}$ miles west from Crane islets, and half a mile North of Hurst island (Gordon group), is small.

Grey rock, which covers at a quarter flood, lies half a mile N.W. from Boyle island, and is dangerous to vessels beating through this channel. The best mark to clear this rock is to keep the Crane islets just touching the north side of Gordon group bearing E. by S. $\frac{1}{4}$ S., which leads nearly half a mile North of it.

See charts, Nos. 555, 582.

Walker group is composed of several small islets and rocks covering an extent of 6 miles in a westerly direction, and 2 miles broad; the highest and western (Kent island) is about 320 feet above the sea. There are several small creeks and bights, which would afford shelter to boats, or even small craft; along their south side some rocks extend a short distance off.

White rock lies 2 miles W.S.W. from Castle point; it is 4 feet above high water. Between White rock and Boyle island a strong tide race usually prevails. Ragged reef, a cluster of rocks 4 feet high and 4 cables in extent, lies 6 cables northward of the west end of Kent island. Nye rock, off the south end of Schooner passage, at the west part of the group, covers at high water; it lies $2\frac{1}{4}$ miles W. $\frac{1}{2}$ N. from White rock; large vessels should not stand inside it to the northward.

Redfern island, the south-western of Walker group, is about half a mile long, and a quarter of a mile wide; half a mile south-east of it are some rocks just above high water, as also to the north-west; its south side should not be approached within 2 cables. Prosser rock, 2 miles W. by N. $\frac{1}{4}$ N. from Redfern island, is small, about 2 feet above high water.

Bright islet is 100 feet high; half a mile N.E. by N. from it lies a reef which covers at high water, and one mile E. by N. $\frac{1}{2}$ N. lies Herbert island, with a reef lying between.

Pine island, at the north-west part of New channel, about one mile in circumference, bold, wooded, and about 250 feet high, is conspicuous from the westward.

Tree islets, some small islets, which are also wooded, lie half a mile N.E. from Pine island.

STORM ISLANDS, in the centre of Queen Charlotte sound, $2\frac{1}{2}$ miles northward of Pine island, are a narrow chain of islets extending 2 miles east and west, and form a most useful land-mark when crossing Queen Charlotte sound. The tops of the trees are about 150 to 200 feet above high water. An Indian fishing village is situated on one of the group, near the east end. Reid island the easternmost of the Storm islands, on the north side of Sealed passage, is about 300 yards long E.N.E. and W.S.W., and 150 yards broad, having a rock above water half a cable off its west end. Naiad islet

is bare and 48 feet high ; it lies half a mile N.E. $\frac{1}{2}$ N. from Reid island.

Sunken rock, on which the sea breaks in bad weather, lies about 5 miles N.E. of Shadwell passage ; from the centre of the rock, Bright island bears S.E. by E., distant $1\frac{1}{2}$ miles, and Pine island, West $1\frac{1}{2}$ miles.

Sealed passage, 5 miles northward of Shadwell passage, between Pine island and the Storm islands, is about $2\frac{1}{2}$ miles wide. This passage should not be attempted. Blind reef, on which the sea breaks in heavy weather, extends nearly across Sealed passage, and closes it to navigation ; close to the western edge of Blind reef there are 17 to 40 fathoms, rocky bottom.

South rock, awash at low water, lies about $1\frac{3}{4}$ miles north-eastward from Blind reef ; from the centre of this rock, Pine island bears S.W. by S., distant $3\frac{1}{4}$ miles nearly. Middle rock, on which the sea nearly always breaks, is covered at three-quarters flood, and lies one mile N. by W. from South rock.

North rock, on which the sea nearly always breaks, is awash at high water, and lies three-quarters of a mile N.E. from Middle rock.

The COAST from cape Commerell (page 302), the north-west point of Vancouver island, takes a south-west direction for 16 miles to cape Scott. It is rather low, but rises at a distance inland to hills 800 and 1,000 feet high ; it is indented by several bays, which, however, are too open to afford any shelter, except from southerly winds ; foul ground extends off in some places more than one mile.

Hecate rock, lying $1\frac{1}{2}$ miles W. by S. from cape Commerell, and three-quarters of a mile off shore, covers at three quarters flood, and the sea breaks heavily over it. Lemon point (Galiano island) just open of or touching Shingle point (Vancouver island) bearing E. by N., leads three-quarters of a mile northward of it.

CAPE SCOTT, the extreme north-west point of Vancouver island, is a small promontory about 500 feet high, connected to the island by a low sandy neck about one cable wide ; some rocks extend West from it for more than half a mile.

There is a bay on both sides of the neck, which would afford anchorage to boats or small craft in fine weather only ; close to its south-west extreme is a small creek among the rocks, difficult of

access, but, once within it, boats may get shelter in southerly gales ; unless acquainted with the locality, it would, however, be hardly prudent to venture it in bad weather.

Caution.—When navigating between cape Commerell and cape Scott, do not approach the shore within $1\frac{1}{2}$ miles.

Tidal streams.—At cape Scott the flood stream comes from the southward, and rounding the cape sets into Goletas channel, its strength varying from one to 3 knots.

Scott channel, between cape Scott and Cox island, is $5\frac{1}{2}$ miles wide. It is a safe navigable channel for any class of vessel, the only known dangers in it being the rocks extending nearly one mile West from cape Scott. There are some heavy tide rips near its east and west sides, but a large vessel may beat through with safety, tacking when upwards of one mile off cape Scott, or half a mile of Cox island.

Scott islands, five in number, with some adjacent smaller islets, extend nearly 20 miles West from cape Scott. There are wide passages between the western islands, but as no soundings have been obtained in them, and strong tide rips and overfalls have invariably been observed raging there, no vessel should venture among or through them, unless compelled to do so.

Cox island, 1,047 feet high, the easternmost and largest of the group, is about $2\frac{1}{2}$ miles in extent, with iron-bound rocky shores and several off-lying dangers. Lanz island, separated from Cox island by a passage half a mile wide, is upwards of 2 miles long, and one mile broad ; its shores, like Cox island, are rocky, and it rises near the centre 1,177 feet above the sea ; both the islands are wooded. In fine weather with southerly winds a vessel may drop an anchor northward of Cox island in 14 fathoms, but at all times it is a neighbourhood to be avoided.

East Haycock, a small islet 80 feet high, is $2\frac{1}{2}$ miles S.W. from Lanz island ; it is covered with a few stunted trees. Some small islets extend a short distance N.W. of it. West Haycock, 5 miles W. $\frac{1}{2}$ S. from East Haycock, is small and rocky, about 180 feet high. Some small islets extend upwards of one mile S.W. of it, foul ground existing around them for half a mile.

Triangle island, the westernmost of the group, 25 miles W. by S. from cape Scott, is 680 feet high, about one mile in extent, and differs from the other islands in being very precipitous and bare of trees, and has a remarkable gap in its summit ; a ledge or reef extends one mile north-west of it.

Caution.—When navigating near the Scott islands, it is recommended to give them a good offing, especially in a sailing-vessel, as the tidal streams set very strongly through the passages between them.

CHAPTER VIII.

WEST COAST OF VANCOUVER ISLAND, FROM
JUAN DE FUCA STRAIT TO SYDNEY INLET.

 VARIATION, 23° East in 1898.

GENERAL DESCRIPTION.—The outer or western coast of Vancouver island is comprised between Bonilla point, at the entrance of Juan de Fuca strait, and cape Scott, the north-west extreme of the island, a distance of upwards of 200 miles. Its general direction is W.N.W. and E.S.E., but the coast is broken into deep inlets, the principal of which, Barclay, Clayoquot, Nootka, Kyuquot, and Quatsino sounds.*

The coast is mostly low and rocky, but rises immediately to mountains of considerable height. It is fringed by numerous rocks and hidden dangers, especially near the entrances of the sounds, and the exercise of great caution and vigilance will be necessary on the part of the navigator to avoid them, even with the Admiralty charts.

Caution.—On no occasion, therefore, except where otherwise stated in the following pages, should a stranger attempt to enter any of the harbours or anchorages during night or thick weather, but rather keep a good offing until circumstances are favourable; and when about to make the coast, it cannot be too strongly impressed on the mariner to take every opportunity of ascertaining his vessel's position by astronomical observations, as fogs and thick weather come on very suddenly at all times of the year, more especially in summer and autumn months; and the current generally sets south-east, across the entrance to Juan de Fuca strait (*see* page 11). The use of the lead is strictly enjoined.

Tides and tidal streams.—All along the outer or West coast of Vancouver island it may be said to be high water at full and change when the moon crosses the meridian, viz., at noon and

* *See* Admiralty chart of Vancouver island, No. 1,917; scale, $m = 0.15$ of an inch.

midnight, the tide showing considerable regularity as compared with the inner waters, the greatest rise and fall being everywhere about 12 feet. There are two high and low waters in the 24 hours all the year round. In summer months the superior high water is at midnight, and in winter months at noon.

The flood stream appears to set along the coast to the north-west, and the ebb to the south-east; neither are of great strength, except in the vicinity of Juan de Fuca strait and the Scott islands.

Telephonic communication has been established between Victoria, Vancouver island, and the following stations on the northern side of Juan de Fuca strait, Port San Juan, at the mouth of Gordon river; Carmanah lighthouse; and Cape Beale lighthouse.

Messages will be transmitted from the stations at fixed tariff rates.

The COAST from port San Juan (page 70) trends 10 miles in a westerly direction to Bonilla point, rising gradually to elevations from 1,000 to 2,000 feet. Bonilla point, the north entrance point of Juan de Fuca strait, is 12 miles N.N.W. from cape Flattery; the point slopes gradually to the sea, and a reef extends half a mile from it. This point should be given a berth of not less than $1\frac{1}{2}$ miles. A conspicuous house stands half a mile eastward of it.*

Four miles westward of the entrance of Nitinat lake is a remarkable waterfall, called by the natives Tsusiat, which may be seen at a good distance, even in thick weather, when it would help to identify a vessel's position, being the only waterfall on this part of the coast.

CARMANAH LIGHT is a group *flashing white light every minute*, showing *three flashes* with intervals of *fifteen seconds* between their points of greatest brilliancy, followed by an interval of *thirty seconds*, during the greater part of which the light is eclipsed. It is elevated 173 feet above high water, and should be visible in clear weather from a distance of 19 miles.

The lighthouse, 46 feet high, is a wooden structure, and with the dwelling attached, is painted white, lantern red.

Position.—Lat. $48^{\circ} 36' 32''$ N., long. $124^{\circ} 46' 10''$ W.

Carmanah fog signal is a horn, worked by steam and compressed air, giving one blast of six seconds duration every half minute.

* See Admiralty chart:—Sydney inlet to Nitinat, No. 584; scale, $m = 0.5$ of an inch.

The fog signal station, constructed of wood, and painted white, with unpainted shingle roof, is situated immediately in front of, and a little below, the lighthouse. It faces S. by E. $\frac{1}{2}$ E.; the horns (which are in duplicate) are 125 feet above high water.

A signal station in addition to the fog horn, for the purpose of enabling passing steam-vessels to communicate during fogs, is established at Carmanah lighthouse. This signal consists of a steam whistle, and passing vessels may communicate by whistle sounds, using the Morse or Continental telegraphic codes.

The signal and rescue station at Carmanah lighthouse, with which vessels may communicate by means of the International code of signals, is under the following rules and regulations:—

Vessels exhibiting their distinctive numbers will have their names transmitted to Victoria, for publication only, free of charge.

Despatches to or from vessels within signalling distance, by flags of the International code, will be duly delivered as addressed, at tariff rates.

Despatches will be charged for at the regular telephone rates, but no charge will be made for signalling between the flag station and vessels at sea.

Despatches may be delivered in cypher, by special request, otherwise they will be transmitted in ordinary language.

A depôt of provisions and other necessities for shipwrecked persons is maintained at the lighthouse.

Nitinat lake, the entrance to which is narrow and shoal, is 7 miles westward of Bonilla point. The lake is of considerable size, extending to the northward. There are one to 2 fathoms in the entrance, and the sea generally breaks heavily across it in bad weather.

Pachena bay, 20 miles westward of Bonilla point, is nearly 2 miles deep in a northerly direction, and half a mile wide, with from 5 to 6 fathoms water, but as it is open to the southward and south-west, and there is usually a heavy swell setting into it, no vessel should anchor there. At its head, on the west side, is a stream where boats can get in and find shelter in bad weather.

Sea-bird islet, off the entrance of the bay, is bare, about 10 feet above water, and of small extent. The two rocks off the islet lie E. by S. $\frac{1}{4}$ S. nearly half a mile; and S. by W. $\frac{3}{4}$ W. half a mile. The latter is awash at high water. There is no safe passage inshore of Sea-bird islet, and it should not be approached within $1\frac{1}{2}$ miles.

BARCLAY SOUND, an extensive arm of the sea, 30 miles westward of the entrance of Juan de Fuca strait, is upwards of 14 miles wide at its entrance, and though encumbered by numerous islands it maintains this breadth for nearly 12 miles inland, when it separates into several narrow inlets or canals, the principal of which, the Alberni canal, extends 23 miles in a northerly direction, its head reaching within 14 miles of the eastern or inner coast of Vancouver island. Off the entrance, and in the southern parts of the sound, are innumerable rocks and islands, with several navigable channels between them, which, however, ought to be used with great caution by a stranger. The shores are low, except in the northern part and among the canals, when they become high, rugged, and mountainous.*

CAPE BEALE, the south-east entrance point of Barclay sound, and of the Eastern channel, is 30 miles N.W. by W. $\frac{1}{2}$ W. from the lighthouse on Tatoosh island. It is a bold rocky point, 120 feet high (the tops of the trees being 300 feet above high water), and some rocks extend off it, from 2 to 4 cables.

The lighthouse is in telegraphic communication with the lighthouse at Carmanah, San Juan, and Victoria; it is also a rescue station for shipwrecked persons.

LIGHT.—Situated on a small islet at the extremity of cape Beale, is a square lighthouse of a light stone colour 42 feet in height, from which is exhibited, at an elevation of 178 feet above the sea, a *flashing white* light, every *half minute*, and should be visible in clear weather 19 miles. A *red* sector is shown over Channel and Western reefs, between the bearings East and S.S.E.

Position.—Latitude $48^{\circ} 47' 20''$ N., longitude $125^{\circ} 13' 30''$ W.

Caution.—The light should not be brought to bear eastward of E. $\frac{1}{2}$ N. so as to avoid the foul ground which extends off the entrances to Barclay sound.

* See Admiralty plan of Barclay sound, No. 592, scale $m = 1.65$ inches.

Tides.—It is high water, full and change, in Barclay sound at noon, and the rise and fall is about 12 feet.

Eastern channel of Barclay sound, is 12 miles long in a N.N.E. direction, and its breadth varies from one to $1\frac{1}{2}$ miles. Its shores are low and rugged, except in the north part, which becomes high. There are several dangers within it; viz., the rocks off cape Beale and Channel rocks at the southern part, and the Fog rock off the east side of Tzaartoos island.

Bamfield creek.—At 4 miles from cape Beale, on the east side of Eastern channel, is the entrance to two creeks, the southern of which extends $1\frac{1}{2}$ miles in a southerly direction, with a breadth of from one to 2 cables; there is room for a vessel to moor at a short distance from its head in 6 fathoms. A narrow passage, 30 yards wide, with 6 feet at low water, runs from the head to an inner basin, which is one mile long, and has from 2 to 4 fathoms.

On the west side of the creek, 3 cables north of Burlo island, a narrow ledge of rock, with 3 to 4 feet over it, projects nearly into the middle of the passage. The track or trail leading to cape Beale lighthouse begins on the western side of the head of the inner basin, and is shewn by a board nailed to the trunk of a large tree and marked "To cape Beale lighthouse."

Grappler creek, the northern arm, extends two-thirds of a mile eastward from the entrance of Bamfield creek, being about 40 yards wide, with from 8 to 10 fathoms, after which it takes a northerly direction for one mile and becomes very shoal. Both these creeks afford good sheltered anchorage to small craft.

Kelp bay, $5\frac{1}{2}$ miles from cape Beale, is two-thirds of a mile wide, a quarter of a mile deep, and affords a fairly-sheltered anchorage in from 6 to 14 fathoms. Its shores are low, and a rock which covers at one-third flood lies one cable north of its south entrance point, and there is a small islet at its north point, which shows a conspicuous white mark; foul ground, marked by kelp, exists in the north part of the bay.

If intending to anchor in this bay, give the entrance points a berth of 2 cables, and anchor in its south part in 6 or 14 fathoms, with the entrance points bearing S.W. by W. and N. by E. This anchorage is easy of access, but the bottom is irregular.

Mark islet, 8 miles from cape Beale, and one cable off the east side of the channel, is small, wooded, and conspicuous from the entrance of Middle channel; the shore between it and Kelp bay is nearly straight, and may be approached to a distance of 2 cables.

Numukamis bay, 9 miles from cape Beale, at the north-east part of Eastern channel, is 3 miles wide and $1\frac{1}{2}$ miles deep; its shores rise gradually to mountains from 1,000 to 2,000 feet high. From the centre of its head Sarita valley extends eastward, a stream of considerable size flowing from it into the bay. In the centre of the bay are the San José and Reef islets, of small extent, and low; from the south point of the latter islet a reef extends one cable.

There is no anchorage except in Christie bay, in its south corner, where there are from 10 to 6 fathoms at a distance of $1\frac{1}{2}$ cables from the shore. The shores of Numukamis bay are steep-to, except off Sarita valley, where a sand-bank extends half a mile.

Poett nook, in the south part of Numukamis bay, about one mile within its south-west point, is a landlocked basin, about 3 cables long and 2 cables wide, with 7 fathoms water. The entrance to it is nearly straight, one cable long, and 150 feet wide, with 7 fathoms in the shoalest part.

Turn island, at the north-east point of the Eastern channel, and dividing it from the Alberni canal is small and wooded, and separated by a narrow boat pass from the east shore. At one-third of a mile south of it is a narrow creek, 3 cables long and half a cable wide, with from 9 to 12 fathoms, available for small craft.

Ship islet, at the south-west point of the eastern channel, 2 miles N.W. $\frac{1}{2}$ N., from cape Beale, is 100 feet high, rocky and bare.

DEER ISLANDS extend N.N.E. and S.S.W. for 10 miles, with a breadth varying from one to 2 miles. They are low, and of inconsiderable size, except the northern (Tzaartoos island), which is 1,026 feet high in parts, and of considerable extent. There is only one navigable passage through them, the Satellite pass, between Helby and Hill islands.

King island, the southernmost of these islands, is from 300 to 400 feet high, about one mile long and half a mile broad; its shores are very rugged and broken, with rocks extending from one to

2 cables off. This island is separated from Ship islet by a passage one-third of a mile wide, but there is a rock in the middle of it, which is awash at high water.

Channel rocks, on the west side of the channel, 3 cables east of King island, and one mile E.N.E. from Ship islet, are about one cable in extent, and cover at half flood; there are 10 to 12 fathoms at one cable eastward of them, and the sea generally breaks over them; they must be carefully avoided.

Diana island, 350 to 400 feet high, separated from King island by a passage full of rocks, is about $1\frac{1}{2}$ miles long, and three-quarters of a mile broad; its shores are rocky. Taylor islet, 50 feet high, lies 3 cables S.S.W. $\frac{1}{2}$ W. from its south-east point.

Todd rock.—At 2 cables from the east side of Diana island is Todd rock, which covers at high water, with 3 fathoms eastward of it.

Helby island, the next island northward of Diana, has off its north side Entrance anchorage, a small but well-sheltered anchorage in from 6 to 9 fathoms, easy of access from either the Eastern or Middle channels, and very convenient as a stopping place for vessels entering or leaving Barclay sound.*

Self point, at the east end of Helby island, appears like an islet and is conspicuous at night, the neck joining it to Helby island being very low.

Wizard islet, to the northward of the anchorage, is small, about 8 feet high, and bare. It is about 4 cables North of Helby island, and those intending to anchor should do so about one cable S.W. of the islet in 6 fathoms.

Hill island, two-thirds of a mile north of Helby island, is small, with a summit of moderate height at its southern end. At a quarter of a mile South of it is a patch of $3\frac{1}{2}$ fathoms, marked by kelp, and there are several small islets and rocks off its east and west sides.

Robbers island, separated from Hill island by a passage full of rocks, is 2 miles long and one mile broad at its widest part. It is low, and steep-to on the eastern side, and between it and Tzaartoois island is a small land-locked basin of 5 to 7 fathoms water, but almost inaccessible in consequence of the many rocks at its entrance.

See chart, No. 592.

* See plan of Entrance anchorage on Admiralty chart, No. 584; scale, $m = 3$ inches.

Tzaartoos or Copper island, the northernmost of the Deer islands, is $4\frac{1}{2}$ miles long in a N.N.E. direction, and $1\frac{1}{2}$ miles broad. It is higher than the other islands, rising in many parts to 800 and its summit to 1,026 feet; its eastern side, except in the vicinity of Sproat bay, is steep-to. Limestone of a fine quality is to be found in its northern part, and there are several indications of copper and iron ores.

Sproat bay, on the east side of Tzaartoos island, is about half a mile wide and 2 cables deep. In its centre are two small islets, and between them and the southern side of the bay a vessel may anchor in from 11 to 15 fathoms. Leading bluff, situated just south of the bay, is a steep point 405 feet high, and conspicuous from the entrance of the Eastern channel.

Fog rock, lying about 2 cables East of Sproat bay, is of small extent, with only 9 feet over it, and steep-to around. This danger is in the track of vessels using Sproat bay, and requires caution to avoid it, not being marked by kelp in the spring.

The east side of Hill island open of Leading bluff bearing S.W. $\frac{3}{4}$ S. leads south-east of Fog rock, and the west side of Nob point well open east of Limestone point N. $\frac{1}{4}$ W. leads well eastward of it.

Nob point, the south-west entrance point of Alberni canal, and north-west point of Eastern channel, is about half a mile northward of Tzaartoos island, and nearly 13 miles from cape Beale. It is a remarkable cliffy projecting point 475 feet high, steep-to on its south and east sides.

ALBERNI CANAL, at the north-east part of Barclay sound, runs in a winding northerly direction for 22 miles, with a breadth varying from 2 cables to one mile, and terminates in a fine capacious anchorage at its head; the shores on either side are rocky and rugged, rising abruptly from the sea to mountains 2,000 and 3,000 feet high; at the head, however, the land becomes low and fertile, a large extent being fit for cultivation. A settlement and large saw mills are established there, and quantities of timber exported. There is also a salmon fishery.*

San Mateo bay, on the east side of the canal, $1\frac{1}{2}$ miles north of Turn point, is three-quarters of a mile wide, and one mile deep; its

shores are high. A rock, part of which dries 3 to 4 feet at low water, with depths of 3 to 6 feet extending a quarter of a cable southward, deepening to 7 fathoms between it and the south shore of the bay, and deep water near in other directions, is situated near the head of San Mateo bay, with Banton island centre bearing N.W. by W., distant $2\frac{1}{4}$ cables.

Mutine point, midway between Mateo bay and Turn island, is rocky. A sunken rock, with a depth of 8 feet on it at low water, and 7 to 8 fathoms close around, lies about one cable offshore, northward of Mutine point, with Turn island north point bearing S.S.W., distant $5\frac{3}{4}$ cables. A berth of 2 cables should be given in passing.

Just south of this point is Crickitt bay, not recommended. Ritherdon bay is reported to be a good anchorage, on clay bottom, but it is deep; at the head of the bay a small flat dries at low water.

UCHUCKLESIT HARBOUR, on the west side of Alberni canal, 2 miles within Nob point, is 3 miles long in a westerly direction, and its average breadth is about half a mile; the north shore is high, rising gradually to mountains of 2,000 and 3,000 feet, but the south shores and head are low. There are two secure anchorages, Green cove at the entrance, and Snug basin at the head, with from 9 to 15 fathoms water. Limestone of a very fine quality is to be procured at the head of the harbour.*

Green cove, just within the entrance, on the north side of the harbour, affords a snug, well-sheltered anchorage, in from 9 to 14 fathoms. Harbour island, off its south side, and completely land-locking the anchorage in that direction, is of small extent, with a clear deep passage on either side into the anchorage; a rock lies half a cable off its south-east point.

This anchorage is convenient as a stopping place for vessels bound to or from Stamp harbour at the head of Alberni canal.

Steamer passage, on the east side of Harbour island, is 2 cables long, and about 150 yards wide in the narrowest part, with not less than 9 fathoms, but it should only be used by steam-vessels, or sailing-ships with a fair wind.

Ship passage, north of Harbour island, is 4 cables long, and 2 cables wide, with from 11 to 20 fathoms, and available for sailing-ships unable to enter or leave Green cove by Steamer passage.

*See plan of Uchucklesit harbour on Admiralty chart, No. 584; scale, m = 3 inches.

Snug basin, on the north side of the head of Uchucklesit harbour, half a mile long in a northerly direction, about 2 cables broad, is well adapted for refitting or repairing a ship, and affords anchorage in 12 to 14 fathoms; but the entrance, though deep, is only 150 feet wide.

Water.—On the north shore, one mile from Green cove, is a large stream of fresh water, with a bank extending a short distance off it.

Nahmint bay, on the west side of Alberni canal, 10 miles within its entrance, is about half a mile in extent, with from 19 to 20 fathoms water, and may be used as a stopping place, if working down the canal; a large stream disembogues at its head.

First narrows, 13 miles from the entrance of the canal, are 3 cables wide at low water, steep-to on the west side, with 26 fathoms in mid-channel; if passing through them at high water, keep well over to the western shore.

Second narrows, 18 miles from the entrance, are 2 cables wide at low water, steep-to on the east side; the west side dries out one cable at low water. The depth in mid-channel is 40 fathoms; and in going through them a vessel ought to keep well over on the eastern side.

STAMP HARBOUR, at the head of Alberni canal, is a capacious and secure anchorage, 2 miles in length, and varying in breadth from 4 cables to one mile. Its western shore is high and rocky, but the eastern side and head are low and fertile, with a quantity of clear level land.*

Somass river, a stream of considerable size, flows into the head of the harbour, and is navigable for canoes several miles; it has its source in a chain of extensive lakes in the interior of Vancouver island, and the quantity of water discharged from it is so great that there is a constant current out of the canal, often exceeding one knot in strength. The town Alberni is a settlement about $1\frac{1}{2}$ miles up the river.

Navigable depths.—Steam-vessels not more than 150 feet in length and of 10 feet draught can reach the town wharf at high water, where there is a depth of 13 feet at low water.

Somass river has black beacons on the west side, and red beacons on the east side of the channel. The least depth at the entrance is 3 feet; the channel deepens to 9 feet within.

* See plan of Stamp harbour, scale, $m = 3\frac{1}{2}$ inches, on chart No. 584.

Observatory islet, in the centre of the harbour, is a small bare rock about 6 feet above high water ; some rocks extend half a cable north of it.

Sheep islet, in the north-west part of the harbour, and 6 cables from Observatory islet, is wooded, and connected to the head of the harbour at low water by a sand-bank.

Anchorage.—The anchorage in the harbour is excellent between Observatory islet and the old wharf, in depths of from 12 to 7 fathoms.

Supplies.—Game is plentiful, and there is excellent fishing in the river and lakes. Fresh beef, vegetables, and fruit are plentiful and cheap.

Tides.—It is high water, full and change, in Stamp harbour, at 0h. ; springs rise 12 feet.

Directions for Barclay sound.—Entering Barclay sound through Eastern channel, cape Beale, may be easily recognised from the south-east, by the lighthouse and by the islands west of it. When approaching or rounding the cape do not come nearer than half a mile to avoid the rocks off it, bring Leading bluff (Tzaartoos island) to bear N. by E. $\frac{1}{4}$ E., when steer up the Eastern channel with that mark on, which will lead clear of the rocks off the west side of cape Beale, and east of Channel rocks.

When the north point of Ship island is in line with south point of King island bearing S.W. by W., the vessel will be well north of the latter, and may then steer up mid-channel about N.N.E. ; on nearing Leading bluff, keep the east side of Hill island open south of it bearing S.W. $\frac{1}{4}$ S., to pass east of Fog rock, until the west side of Nob point comes open east of Limestone point bearing N. $\frac{1}{4}$ W., when steer up in mid-channel.

If bound to Stamp harbour, after entering Alberni canal keep in mid-channel, except when passing through the First and Second narrows (*see* page 321), and anchor on the eastern side of the harbour with the bearings already given.

After entering Alberni canal, a strong southerly wind will generally be experienced, blowing home to the head ; it, however, usually falls a little during the night.

If beating into the Eastern channel (which should only be done by small or quick working vessels). As a rule, when standing towards the east shore do not approach within 2 cables, and after passing the Channel rocks, keep outside of the line of Deer islands.

Anchorage.—If necessary to anchor, Entrance anchorage in the Deer group, just north of Helby island, is recommended, being secure, and easy of access from either Eastern or Middle channels. Kelp, Sproat, Christie, and Nahmint bays, also Green cove, are easy of access, and may be used as stopping places.

Middle channel, the largest passage into Barclay sound, is upwards of 12 miles long N.N.E., and 3 miles wide in the narrowest part, being bounded on either side by numerous small islands and rocks. The depths within it vary from 30 to 54 fathoms, and off its entrance are three dangers, viz., Western reef, Channel reef, and Danger rock, which only break in heavy weather, and require great caution to avoid. In southerly or south-westerly gales there is generally a very heavy sea in this channel. Swiss Boy island just open west of Entrance island bearing N.N.E. (northerly) leads half a mile East of Danger rock; Mark islet open north of Ragged islet bearing N.E. leads three-quarters of a mile West of it, and the same distance East of Channel reef; and Sail rock in sight west of Storm island bearing N.W. by W. $\frac{1}{2}$ W. leads south of it and Channel reef.

Danger rock, in the south-east part of the entrance to Middle channel, $3\frac{1}{2}$ miles W. $\frac{1}{2}$ N. from cape Beale, and $2\frac{1}{2}$ miles S.W. by W. $\frac{1}{2}$ W. from Ship islet, is of small extent. There are from 22 to 40 fathoms at a distance of 2 cables around it.

Channel reef lies near the centre of the entrance to Middle channel, $3\frac{1}{2}$ miles W. $\frac{1}{4}$ S. from Ship islet, and $1\frac{1}{2}$ miles W.N.W. from Danger rock. It is about one cable in extent, and uncovers at low water.

Western reef lies in the south-west part of the entrance to Middle channel, $5\frac{1}{2}$ miles W. $\frac{1}{4}$ S. from Ship islet, and one mile south of the Broken group. It is about one cable in extent, awash at low water, and should not be approached within half a mile.

Entrance island, at the south-east part of Middle channel, and nearly one mile W.N.W. from Ship islet, is of small extent, and wooded; the tops of the trees being 350 feet above high water. It

is steep-to and clifly on the south and west sides; a quarter of a mile north-east of it is Leach islet and some off-lying rocks.

Hecate passage, leading into Middle channel between entrance island and Danger rock, is 2 miles wide, and is the best way to enter Middle channel in thick weather, or from the southward or eastward.

Shark pass, between Entrance and Ship islands, is two-thirds of a mile wide, and may be used by steamers or sailing-vessels with a fair wind.

Dodger cove.—Between Diana and King islands are two small islands (Hains and Seppings) connected to each other by a reef. Dodger cove, on the east side of Middle channel, is situated between these islands and Diana island, and is a narrow creek about two-thirds of a mile long and one cable wide, with several rocks and small islets off its entrance. It affords good shelter to coasters or small craft at its head, where are from $2\frac{1}{2}$ to 3 fathoms water, but it should not be attempted by a stranger, as the entrance along the south side of Diana island is rather intricate.

Dodger cove is frequented between January and July, especially in bad weather, by the vessels engaged in the seal fishery.

SATELLITE PASS, 3 miles from Entrance island, lies between Helby and Hill islands, connecting the Eastern and Middle channels. It is about one mile long and half a mile wide; the depths in the middle varying from 9 to 22 fathoms, but 3 cables south of Hill island on the north side of the pass is a shoal patch of $3\frac{1}{2}$ fathoms, marked by kelp; Leading bluff open of the east side of Hill island bearing N.E. by N. leads to the south-east of this shoal. Do not attempt to pass between Ragged island and Helby island.

If bound to Alberni canal, after having entered Middle channel, proceed through this pass into the Eastern channel and on to the inlet through the latter, keeping about one or 2 cables north of Ragged, Helby, and Wizard islands.

Village rocks, lying on the east side of Middle channel, 6 miles from Entrance island, and one-third of a mile from the north-west point of Robbers island, are 2 cables in extent, nearly awash at low water, and the sea usually breaks on them in heavy weather; they should not be approached within a quarter of a mile.

Chain islands, on the east-side of Middle channel, are a chain of small islets and rocks nearly 4 miles long in a northerly direction. They lie parallel to the west side of Tzaartoos island, being separated from it by a passage three-quarters of a mile wide, but filled with rocks, and through which no vessel should attempt to pass.

Swiss-boy island, the southernmost of this group, is small and cliffy. Bull rock, 2 cables West of it, is of small extent, and has less than 2 fathoms on it, and breaks in bad weather.

Caution.—Do not approach the western side of Chain islands within half a mile, except when rounding their north part.

Junction passage, at the north-east part of Middle channel connecting it with Alberni canal and Eastern channel, lies north of the Chain and Tzaartoos islands. It is 2 miles long in an easterly direction, and about one-third of a mile wide.

On the north side of the passage is Rainy bay, about $1\frac{1}{2}$ miles in extent; but there are several rocks and small islets within it, the shores are rugged and broken, and the water too deep to afford anchorage. Ecoole village is situated on Seddall island W. by N. $\frac{1}{2}$ N. from Nob point; the wharf can only be used by very small craft.

Northward of this bay, and connected to it by a very narrow boat pass, is Useless arm, a large sheet of water with from 9 to 20 fathoms, not accessible to vessels.

BROKEN GROUP, which forms the boundary of Middle channel along the west side, is composed of a number of small islands and rocks, covering a space upwards of 6 miles long and 4 wide. They are low and the principal ones wooded, the largest being about one mile in extent; there are several passages through them, and a good anchorage (Island harbour) in their north-east part, but as a rule no stranger should venture among them or approach within half a mile, as the depths are irregular, and other rocks may exist besides those known.

Redonda, the south-east island of this group, lies $4\frac{1}{2}$ miles W. $\frac{1}{2}$ N. from Ship islet. It is small, wooded, and of a round shape; some rocks extend 3 cables off its south-east point, and half a mile E.N.E. of it is a reef which covers at half-flood. Between Redonda island and Channel reef is a passage one mile wide, with from 19 to 33 fathoms, but it should not be attempted by a stranger.

Village island, the largest of the group, is $1\frac{1}{2}$ miles North of Redonda, and upwards of one mile in extent; the east side is bold and cliffy. On its north side is a village of considerable size, where landing may be effected in almost any weather. Off its west side are several small islets and rocks, around which is Port Effingham, a good and safe anchorage; when passing into the inner basin, which is perfectly landlocked, and has good holding ground, care should be exercised when passing the island. There is good fresh water at a small stream in the inner anchorage. It is much used by sealing schooners in preference to Dodger cove.

Coaster channel, which runs through Broken group, north of Village island, is about 4 miles long, and from half a mile to one mile wide, and has depths of from 10 to 24 fathoms in it; but as there are several rocks within it, this channel should not be attempted by a stranger.

A sunken rock lies in Coaster channel 3 cables N.W. $\frac{1}{2}$ N. from the north end of Grassy island.

A rock, with a depth of 4 fathoms on it, lies in Coaster channel, with Puffin islet summit bearing N.N.E. $\frac{3}{4}$ E., distant 4 cables. A rock, awash at low water springs, lies eastward of Owens island, with Puffin island summit bearing N.W. by W., distant $5\frac{1}{2}$ cables.

Village reef, in the east part of Coaster channel, half a mile north of Village island, is small, and 4 feet above high water.

A rock, with a depth of 7 feet on it, and marked by kelp, lies in the entrance to the bay on the north-west side of Village island, in a position with 40-foot rock bearing N.N.W., distant $1\frac{1}{2}$ cables.

Island harbour, formed by several rocks and islands, in the north-east part of Broken group, Puzzle and Gibraltar islands on the north, and Mullins and Keith islands, on the west, at 5 miles from the entrance to Middle channel, is a good, well-sheltered anchorage, about half a mile in extent, with from 10 to 14 fathoms; and there are two good passages into it from Middle channel.*

Maud rock, awash, lies $1\frac{1}{2}$ cables S.W. by W. from the west extreme of Mullins island, and a shoal extends E.N.E. from Marchant island, on which there is a depth of 9 feet at $1\frac{1}{4}$ cables from the island.

Shoal water extends eastward from the rock (above water), charted $1\frac{1}{4}$ cables East of Turtle island, having a depth of 9 feet at $1\frac{1}{4}$ cables E. by S. from the rock above mentioned.

* See plan of Island harbour on Admiralty chart, No. 584; scale, $m = 6$ inches.

A cluster of rocks, which dries 2 to 3 feet, lies in the position of the 3 fathoms, charted northward of Keith island.

Protection island, 250 to 300 feet high, is two-thirds of a mile long, narrow, and its coast is rugged and broken. Observation islet, 30 feet high, and another small islet south of it, lie half a cable from the middle of the south side of Protection island.

Elbow rocks, which cover at two-thirds flood, lie $1\frac{1}{2}$ cables N.N.E. from Elbow island, between it and Protection island, and are steep-to on all sides.

Pinnacle rock, 3 cables East of Elbow island, almost in the fairway of the South entrance, only breaks in heavy weather, and is dangerous. Channel rock, in the middle of Harbour entrance, 4 cables from its east end, is of small extent, with 9 feet on it at low water.

No one should attempt to enter this harbour without the chart, unless thoroughly acquainted with the place; and it should only be entered by sailing-vessels with a fair wind.

The best anchorage is near the centre of the harbour, about 2 cables west of the north-west end of Protection island, in from 10 to 12 fathoms, protected from the northward and from the westward by Puzzle, Keith, and Mullins islands.

It is high water at full and change in Island harbour at noon; springs rise 12 feet.

Nettle island, the north-east island of Broken group, is nearly one mile in extent, steep-to off its north side, but east and west of it islets and rocks extend half a mile. Swale rock, at half a mile East of the eastern point of Nettle island, is a small bare rock 8 feet above high water, which is very conspicuous from Middle channel.

Sechart channel, north of Broken group, connects Western and Middle channels. It is a winding channel 5 miles long, and about half a mile wide. A rock that uncovers at low-water springs lies $2\frac{1}{2}$ cables S.W. $\frac{1}{4}$ S. from Sechart village, and $1\frac{1}{2}$ cables N.W. $\frac{1}{4}$ N. from the westernmost of the Hundred islands.

Capstan island, 3 miles from the east entrance and nearly in the middle of this channel, is small, and the southernmost of a number of small islands extending nearly one mile from the north shore; a rock lies half a cable south of it. North-westward of these islets is

the extensive village Sechart, off which a vessel may anchor a quarter of a mile from the shore in 14 fathoms.

Eastward of Canoe island in the approach to Anderson's wharf, rocks extend from the eastern shore of the passage to nearly mid-channel. Anderson's wharf is 200 feet long, and has a depth of 18 feet water at the outer end.

Northward of Sechart channel the west side of Middle channel is bounded by two Narrow islands about 2 miles in length, and separated from the mainland by a narrow boat pass; they should not be approached nearer than half a mile.

Bird islets, two small, bare, conspicuous rocks, lie almost in the centre of the north part of Middle channel, 9 miles from the entrance; the southern islet is 35 feet, and the northern 30 feet above high water; some rocks, which cover, extend one cable northward and westward of them.

Effingham inlet, in the north-west part of Middle channel, is narrow, and about 8 miles long; its shores on both sides are high and rocky, and there is no anchorage. A sunken rock lies $3\frac{1}{2}$ cables N.E. from the north end of Webster island, and nearly one cable from the east shore of Effingham inlet.

Vernon bay, one mile East of Effingham inlet, at the head of Middle channel, is upwards of one mile in extent, open to the southward, and too deep to afford anchorage; its shores are high and rocky. At 3 cables S.E. from Palmer point, the south-west extreme of Vernon bay, is Edward rock, 3 feet above high water, and 2 cables off the eastern shore of the bay; just within the entrance is a reef awash at high water.

Western channel, leading into Barclay sound westward of Broken group, between it and Great bank, is about 4 miles long, and from one to 2 miles broad. Sail rock, lying off the south-west part of Broken group, is a bare rock like a sail, rising 100 feet above the sea, and very conspicuous; northward of it are some low islets and rocks extending from the south-west island of the group; and on the east side of Western channel foul ground projects in some places half a mile off.

Black rock, at the south-west part of Western channel, $3\frac{1}{2}$ miles S.W. by W. $\frac{1}{2}$ W. from Sail rock, is 10 feet above high water, and small; some rocks which break extend 2 cables east of it. Great Bear islet, 30 feet high, lies $1\frac{1}{2}$ miles N.N.E. from Black rock; about

half a cable off its east end there is a rock awash. Channel rock at the south-east extreme of the Great bank, on the west side of the Western channel, is 15 feet above high water, bare, and steep-to on its eastern side. From Channel rock a reef extends $1\frac{1}{2}$ cables N. by W., upon which the sea breaks at low water.

Great bank is, within the 10-fathoms edge, $2\frac{1}{2}$ miles long, and its greatest breadth is $1\frac{1}{2}$ miles; on the shoalest parts, near the north and south-west ends, are from 3 to 4 fathoms, over which in heavy gales the sea breaks. Shag rock, 8 feet above high water, on the eastern side of the channel, $2\frac{1}{4}$ miles N. $\frac{1}{4}$ W. from Sail rock, and half a mile West of the Broken group, is small and bare, and foul ground exists one cable from it.

Round island, near the middle of the north part of the channel, $3\frac{1}{2}$ miles N. by W. from Sail rock, is small, but 200 feet high.

Gowlland, Table, and Castle islets, at the northern termination of Western channel, are small, but steep-to on their south sides. At 2 cables N.W. of Table islet is a rock, awash at high water, and half a mile N.E. from it is a patch 3 cables in extent, with from 4 to 7 fathoms; the best passage into Toquart harbour appears to be eastward of these islets. A rock, which dries 9 feet, lies about three-quarters of a cable eastward of Gowlland islet, and a rock, awash at low water, lies one cable North from the island.

Directions.—Western channel, though wide, should only be used by steam-vessels or sailing-vessels with a fair wind, and not then unless bound to Toquart harbour, in the north-western part of Barclay sound. When entering, give Sail and Black rocks a berth of half a mile, and steer up in mid-channel, passing half a mile West of Round island.

By keeping Castle islet well open westward of Round island, bearing North, will lead between the reefs.

Peacock channel, through the north-west part of Broken group, is about 3 miles long, and nearly one mile wide. A rock lies nearly in the centre of the channel midway between Dodd and Pender islands. It has 4 feet water on it, and lies $4\frac{1}{2}$ cables S. by W. $\frac{1}{4}$ W. from the south end of Pender island. Galley rock, on the east side of Peacock channel, $1\frac{1}{2}$ miles within the west entrance, and 2 cables west of Puzzle island, uncovers at low water.

Mayne bay, northward of Lyall point, is 2 miles long and one mile deep. Its shores, except near the north part, are low and steep-to, and there is no anchorage except in its south-east corner, where there is a limited area with 14 fathoms at about 2 cables off-shore.

Stopper islands, lying half a mile West of Mayne bay, are about $1\frac{1}{2}$ miles in extent, wooded, and 200 feet high; the rocks extend from 2 to 3 cables off their east and west sides. Larkins island lies close off their west side; a reef awash at high water extends $2\frac{1}{2}$ cables N.N.W. from its north end. Richard rock, 4 cables eastward of Stopper islands, is steep-to on the east side. Do not pass between this rock and the islands. Hermit islet, 3 cables North of Stopper islands, at the north-west point of David channel, is low; at 2 cables N.W. by W. from it is a small wooded islet, about 50 feet high to the tops of the trees; a rock lies close to its south-west side.

Toquart harbour, in the north-west corner of Barclay sound, is about $1\frac{1}{2}$ miles in extent, and well sheltered from all winds by Stopper islands. Its shores are low and steep-to, except from the head, where Black patch, a shoal with 9 feet on its outer part, extends out nearly half a mile.

Image island, lying 3 cables off shore in the north-east part of the harbour, is small, and northwest of it is an excellent anchorage in from 11 to 12 fathoms. Pipestem inlet, extending upwards of 5 miles N.E. from Toquart harbour, has depths of 19 to 37 fathoms, but affords no anchorage whatever; its shores are rocky, and rise abruptly to 1,000 and 2,000 feet above the sea; at its head is a small patch of swampy ground, with some fresh-water streams flowing through it.

Entering Toquart harbour by David channel, after passing Lyall point, steer well into Mayne bay, to avoid Richard rock; when Hermit islet comes well open of the Stopper islands, steer for the harbour, passing midway between the Sisters and Stopper islands, and eastward of Hermit islet; anchor in 14 fathoms, with Image island bearing N.E. by N., and Hermit islet S.E., or proceed further northward and anchor in 11 or 12 fathoms.

Ship channel, between the Vancouver coast and Great bank, southward of Forbes island, leads into the Ucluelet arm, and is 4 miles long N.N.E. and S.S.W., two-thirds of a mile broad in its narrowest part. Double island, at its south-east part, is of small

extent, steep-to on the west side, but from the south and east sides foul ground extends upwards of half a mile. Kelp islet, 6 cables N.W. of Double island, on the opposite side of the channel, is low and bare; kelp extends 2 cables South of it.

Ugly channel, eastward of Shelter islands, is bounded on both sides by rocks and reefs, and, though probably deep, it has not been sufficiently examined to recommend its being used by a stranger. Starlight reefs, at its south-east part, are a cluster of rocks about 7 cables in extent, some above high water; in bad weather the sea breaks heavily over them. Look-out island, on the west side of Ugly channel, is well wooded, of small extent, and about 150 feet high; at 3 cables South of it is Humphries reef, a patch of rocks 2 cables in extent, and 6 cables North of it lies a bare rock 6 feet above high water.

UCLUELET ARM, just within the south-west part of Barclay sound, extends $5\frac{1}{2}$ miles N.W. by W. Its south shore is low, and the northern shore rises gradually to a flat-top range of considerable height, the south-east shoulder of which, mount Ozzard, 2,270 high, is conspicuous from the south-east.

The depths in this arm vary from 4 to 8 fathoms, and there is secure and well-sheltered anchorage between Sutton rock and Channel island. Care should be taken when entering this arm, as there are several sunken rocks near the shore.

There are stores and post office at Ucluelet.

Shelter islands, upwards of half a mile S.E. of the entrance, are small islets and rocks about one mile long and 3 cables wide, which completely shelter the arm from the sea. Centre reef, 3 cables westward of their northern part, is of small extent, and about 3 feet above high water. Alpha passage, between Centre reef and Shelter islands, is 2 cables wide at its narrowest part, with depths of from 11 to 14 fathoms. There is, however, said to be a sunken rock in this passage, and it should, therefore, not be used.

Carolina channel, westward of Centre reef, appears to be the best for a stranger to use if entering the Ucluelet arm from seaward, but in heavy weather, when there is a long swell from seaward rolling in the entrance often appears to be an unbroken line of surf.

A small pinnacle rock, with a depth of 5 feet on it, with $4\frac{1}{2}$ to 5 fathoms between it and the shore, and $6\frac{1}{2}$ fathoms close eastward, marked by seaweed but not kelp, lies nearly half a cable from the

southern entrance point into Stewart bay, with Native islet bearing N.W. $\frac{1}{2}$ W., distant $4\frac{1}{4}$ cables.

A rock, with a depth of 5 feet on it, and $3\frac{1}{2}$ fathoms close to on its northern side, lies with Native islet bearing N.N.W. $\frac{1}{2}$ W., distant $4\frac{1}{4}$ cables.

A rocky patch, marked by kelp, with a depth of 5 fathoms on it, is situated with Amphitrite point bearing W. $\frac{3}{4}$ S., distant $3\frac{3}{4}$ cables.

A rocky patch, marked by kelp, with a depth of $3\frac{1}{4}$ fathoms on it, is situated with islet (50 ft.) on south-west side of Round island bearing W. $\frac{3}{4}$ S., distant $1\frac{1}{4}$ cables.

A rock, which dries 2 to 3 feet, with 4 fathoms close to on its northern side, lies about half a cable from the northern coast of Round island, with Native islet bearing N.W. $\frac{1}{2}$ N., distant $5\frac{1}{4}$ cables.

Stewart bay, on the north side, half a mile within the entrance, is 2 cables deep, and half a mile wide. In its centre is a rock awash at high water, and the bay is too shallow to afford anchorage except to a coaster; there is a native village of considerable size in its west part, off which some small rocks extend about half a cable.

A rock, with $2\frac{1}{4}$ fathoms on it, lies with wharf in bay on south side of entrance bearing S. $\frac{1}{2}$ W., distant 3 cables; and Native islet N.W. $\frac{1}{4}$ W.

A rock, with 3 feet water, marked by kelp and eel grass, lies nearly three-quarters of a cable off the first point north-west of the Indian village abreast Leading point. There are $2\frac{1}{2}$ fathoms close around, and the depth increases quickly to 7 fathoms in the fairway.

Channel islet, in the middle of the arm about 2 miles within the entrance, and one mile past Leading point, is small. There is a clear passage north of the islet with 7 fathoms, but only 2 fathoms on its south side; at 2 cables N.W. by W. from the islet lies a small rock above high water, steep to on all sides, except the south-east, from which a shoal with $2\frac{1}{4}$ fathoms water extends one cable. To the westward of Channel islet the arm becomes wider, affording good anchorage in 4 to 7 fathoms, over a space one mile long and half a mile wide.

Sutton rock consists of two rocks, each of small extent, lying 93 yards apart in a N.W. $\frac{1}{4}$ W. and S.E. $\frac{1}{4}$ E. direction. The southern rock, 3 cables S.E. by E. $\frac{1}{4}$ E. from Channel island, has 7 feet on it, the northern one 10 feet. A spar buoy coloured red and black in horizontal stripes is moored on the shoalest of the rocks.

A little more than one cable N.E. of Sutton rock, and 30 feet from low water mark, is a narrow rocky ledge 40 feet in length, which dries 2 feet.

Directions.—Several channels lead into Ucluelet arm, with apparently deep water through them, but there are so many rocks and dangers in their vicinity that great vigilance is recommended, and it would hardly be advisable to enter without a pilot; should it, however, be necessary to do so, steer for Amphitrite point, and when about 2 cables from it, proceed eastward through the Carolina channel, keeping about 2 cables off its west shore to avoid Centre reef. Pass Round island, distant one cable, and steer W.N.W. up the arm, keeping well over to the south shore; pass Leading point within half a cable to avoid the rocks abreast of it on the north side, and anchor midway between Sutton rock and Channel islet, in 6 to 9 fathoms; or proceed further westward, where a more extended anchorage will be found, taking care to pass north of Channel islet.

WRECK BAY, 4 miles westward of Amphitrite point, is nearly 3 miles wide, and one mile deep, with the small islet Florencia in the centre; there are several rocks in the bay, and it is totally unfit for anchorage.*

Long bay, 8 miles westward of Amphitrite point, is 7 miles wide and upwards of one mile deep, with from 8 to 11 fathoms between the entrance points; there are several rocks in it, and no vessel should anchor here; at its south-east point, just within the reefs, good shelter for boats will be found in all weathers. Schooner cove, in the north-west part of the bay, is of small extent, with 2 fathoms water; it would afford good shelter to a coaster or small vessel. Portland point, the north-west extreme of Long bay, is high and abrupt, with some small rocks and islets around it, at a distance of half a mile. Gowlland rocks, $1\frac{1}{2}$ miles W.S.W. from Portland point, are of small extent, bare, and from 10 to 15 feet above high water; they should not be approached nearer than one mile.

Caution.—When navigating between Barclay and Clayoquot sounds, do not approach the shore within 2 miles.

CLAYOQUOT SOUND comprises a number of inlets, covering an area 30 miles long, and 16 broad. The entrance to it is fringed by numerous dangerous rocks, which require caution to avoid;

* See Admiralty chart :—Sydney inlet to Natinat, No. 584; scale, 1" = 0.5 of inch.

it lies between Cox and Sharp points, bearing from each other W. by N. $\frac{1}{4}$ N., and E. by S. $\frac{1}{4}$ S., distant 21 miles.

There are several channels into the inner waters of this sound, but with the exception of Ship channel they should not be attempted by a stranger.

Tides.—It is high water, full and change, in Clayoquot sound at noon, the rise and fall being about 12 feet.

Cox point, at the south-east extreme of Clayoquot sound, is rocky, and Vargas cone, a remarkable summit, 432 feet high, rises just within the point, and is very conspicuous from the westward.

Templar channel is a winding passage about 4 miles long in a N.N.W. direction, with an average breadth of half a mile. The soundings vary from 8 to 10 fathoms in its entrance, to $3\frac{1}{2}$ fathoms in its shoalest part near the north end, and a shoal bank lies in the middle abreast Wakenenish island; in heavy weather the sea breaks across the channel. No vessel drawing more than 12 feet should attempt to enter the sound by this channel, and not even then without a pilot, as it is very intricate, and no directions can be given. False bay, just northward of Cox point, is about half a mile in extent, open to the south-west, and unfit for anchorage; its shore are low and sandy.

Wakenenish island, on the west side of the channel, one mile from Lennard island, is about 200 feet high; at its south point is E cha chets, a large Indian village, generally occupied by the natives during the summer fishing season.

Stubbs island, 2 cables west of Round island, has a sand bank extending one mile northward of it, the extreme of which is marked by a black can buoy.

Broken channel, between Wakenenish and Vargas islands, westward of the former, is upwards of 2 miles long, and half a mile wide in its narrowest part, with from 6 to 15 fathoms water; several rocks lie off its entrance, and on both sides; the tidal streams run through from 2 to 5 knots, and no one should use it without a pilot.

McKay reef, lying off the entrance, 4 miles W. by N. from Cox point, is of small extent, 5 to 10 feet above high water, and the sea generally breaks heavily over it. Passage rock, which covers at high water, lies two-thirds of a mile North of McKay reef.

Vargas island, on the west side of Broken channel, is $4\frac{1}{2}$ miles long, and $4\frac{1}{2}$ miles wide at its broadest part, and its surface is low

and undulating ; on the eastern side near the middle is Kelsemart, a native village. Blunden island, westward of Open bay, is of small size ; numerous reefs are scattered about this locality.

SHIP CHANNEL, westward of Vargas island, between it and a number of small islands and rocks, is the only passage into Clayoquot sound which should be attempted by a stranger, it is 5 miles long and from three-quarters to $1\frac{1}{2}$ miles wide. The depths in the south part vary from 20 to 22 fathoms, decreasing to $5\frac{1}{2}$ fathoms in the shoalest part near the north end ; the tidal streams set through it at from one to 2 knots. Bare island is small, 40 feet high in the centre, and forms a good mark for identifying Ship channel ; a rock on which the sea breaks lies 5 cables E. by S. from it ; also, a rock on which the sea breaks lies about half a mile W. by S. from the summit of Bare island.

Plover reefs, on the eastern side of the channel half a mile N.W. from Bare island, are of considerable extent, stretching one mile from the western side of Blunden island ; some parts are 6 feet above high water, and there are 5 fathoms at 2 cables West of them.

Sea Otter rock, 2 miles W. by N. from Bare islet, is very small, 6 feet above high water, and there are 5 fathoms close-to, off its east side. A rock upon which the sea breaks lies about a quarter of a mile eastward of Sea Otter rock. Shark reefs, some of which cover, others 6 and 10 feet above high water, lie 2 miles N.E. $\frac{1}{2}$ N. from Sea Otter rock ; they are about 3 cables in extent, and should not be approached nearer than 2 cables on their south and east sides. Lawrence islands, on the west side, $2\frac{1}{2}$ miles from Sea Otter rock, are small, low, and wooded ; but steep-to on the east side.

Bartlett island, half a mile westward of Lawrence islands, is low and wooded ; its shores are much broken, and a number of rocks extend for a quarter to half a mile on all sides of it, and the island should not be approached within the latter distance. Twin islets, 4 miles from Sea Otter rock, are low, but wooded, and connected at low water ; kelp extends one cable South of them.

Hecate passage, north-east of and connecting Ship channel with the inner waters of Clayoquot sound, is 3 miles long and upwards of one mile wide ; there are several rocks on both its shores, and a sand bank in its centre, but to the southward of the bank along the north coast of Vargas is a clear passage with not less than $5\frac{1}{2}$ fathoms.

Half-tide rock, 2 cables from Vargas island, is of small extent, and covers at half flood. Hobbs islet open West of Burgess islet bearing S. by W. $\frac{1}{4}$ W. leads 2 cables West of it; and the Twins in line with the north-west Whaler island bearing W. by S. leads 2 cables north of it, and south of North bank.

Cat-face mountains, fronting Ship channel, are a remarkable flat-top range 3,370 feet high, with some patches of cliff and white bare rock in about the middle of their south side. They are very conspicuous from seaward.

Ahousat village with stores and post office is now moved to Flores island half a mile north of Base point.

Deep pass, between two islands at the north-east part of Hecate passage, is about 3 cables long and $1\frac{1}{2}$ cables wide, with 9 fathoms water, and is the best channel leading from Hecate passage into the inner waters. The tidal streams set at the rate of from 2 to 3 knots through it.

Hecate bay, 2 miles North from Deep pass, on the west shore, is 6 cables wide and 3 cables deep, with from 9 to 10 fathoms; it is one of the best anchorages within the sound, being easy of access and well sheltered. There is a stream of fresh water in the middle of the bay, very convenient for watering.

Cypress bay, 4 miles North from Deep pass, is nearly 2 miles in extent, with from 12 to 26 fathoms over it. On the east and west sides the shores are low, but are high on the north. Mussel rock lies 4 cables off the east shore of the bay and half a mile N.N.W. $\frac{1}{4}$ W. from the east extreme. It is of small extent, and covers at three-quarters flood. Calm creek, in the north-east part of Cypress bay, is 6 cables long in the same direction, with from 4 to 6 fathoms, but the entrance to it being narrow, with only 2 fathoms water, it is useless for anchorage, except to small craft.

There is good anchorage in Cypress bay in 12 fathoms near its north part, at half a mile from the shore; and though it is open to the southward, no sea rises.

Meares island, within the eastern part of Clayoquot sound, is 6 miles in extent in a northerly and 7 miles in an easterly direction. The coast, except on the north side, is high and rugged, and there

are several mountains on the east and west sides upwards of 2,000 feet above the sea; one on the latter side, named Lone cone, an isolated conical mountain, is 2,325 feet high, and very conspicuous from seaward near the entrance of Ship channel. Disappointment inlet runs nearly through the island from the south side to north, and there are several other bights and bays. Clayoquot settlement is on the south-west extreme of the island.

Deception channel, a continuation of Broken channel, between Meares and Vargas islands, is about 3 miles long north and south, and half a mile wide, with irregular depths of from 5 to 20 fathoms.

There are several rocks in its north-west part: and a large sand-bank, which partly dries at low water, extends from Vargas island along its west side for nearly 2 miles, reducing the deep part of the passage to about 3 cables. The tidal stream sets at from 2 to 5 knots through this channel, and a stranger should not attempt its navigation. Local steam-vessels and those having local knowledge use it, keeping close along the north shore.

Ritchie bay, on the north-west side of Meares island, 2 miles eastward of Deep pass, is one mile wide, half a mile deep, and affords anchorage in $5\frac{1}{2}$ to 10 fathoms at 2 cables off its eastern side. The shores of the bay are rocky. Yellow bank, which lies almost athwart the entrance of this bay, is about three-quarters of a mile in extent, and has 3 feet on the shoalest part.

If wishing to anchor in Ritchie bay, and coming from Deep pass, proceed eastward to pass about one cable North of Robert point, and keeping the same distance off the south shore, steer into the bay, anchoring in 5 or 7 fathoms about 2 cables from its east side, with the extremes bearing North and S.W. $\frac{3}{4}$ W.; entering from the northward, steer midway between Saranac island and the north point of the bay.

Bedwell sound, the entrance to which is $1\frac{1}{2}$ miles East from Cypress bay, is 7 miles long and one mile broad till within 2 miles of its head, when it contracts to 3 cables; the shores are high and rugged, rising on the east side to sharp jagged peaks from 2,000 to 4,400 feet above the sea. At its head is a small patch of low swampy land, and a valley from which Bear river, a stream of considerable size, flows into the sound. The depths in the sound vary from 35 to 45 fathoms, and there is no anchorage whatever within it.

Race narrows, east of Bedwell sound, are $1\frac{1}{2}$ miles long, and about 2 cables wide in the narrowest part; the tidal streams set through them at 3 to 4 knots, the flood from the westward, and there are 10 fathoms in the shoalest part of mid-channel. Ripple islets, off the east entrance to Race narrows, are about 20 feet high, small and covered with bushes; there are some strong tide rips around them.

Warn bay, to the eastward of Race narrows and one mile from the north-east part of Meares island, is upwards of 2 miles long, and about three-quarters of a mile wide; the shores on both sides are high, but low at the head, from whence issue several streams, and a sand-bank dries out upwards of one cable. The depths in the bay are irregular, varying from 50 to 8 fathoms, but a vessel may anchor about 3 cables off shore near the west side of the head of the bay in 14 to 16 fathoms.

Fortune channel, between the east side of Meares island and the main, is 5 miles long, north and south, and varies in breadth from 3 cables to $1\frac{1}{2}$ miles; its shores are high, and there are several off-lying rocks on its west side near the middle. The east shore of the channel from Warn bay to Deception pass is rocky, and indented by several small bays which afford no anchorage.

Mosquito harbour, on the east side of Meares island, is narrow, and about 2 miles long; there are several rocks and small islets off its entrance, but it affords good anchorage inside in from 4 to 7 fathoms; the entrance is $1\frac{1}{2}$ cables wide, with 11 fathoms, and the harbour is easily entered by a steamer.

Hankin rock lies $2\frac{1}{2}$ cables south-west of Plover point, and in the track of vessels entering Mosquito harbour: it is marked by kelp, and there are 23 fathoms midway between it and the point.

Wood islands, in the middle of the entrance, nearly half a mile west of Plover point, are small, and some rocks lie a short distance off their south part, but there is a clear passage into the harbour on both sides of them, with 7 fathoms water.

Blackberry islets, in the centre of the harbour and three-quarters of a mile from the entrance, are small, but steep-to, there being 4 fathoms within one cable of them.

When entering Mosquito harbour, round Plover point one cable distant to avoid the Hankin rock, and keep midway between Wood islands and the east shore, anchoring in about 7 fathoms, one-third

of a mile south of the Blackberry islets; a vessel may enter westward of the Wood islands by keeping midway between them and the shore.

Deception pass, at the south extreme of Fortune channel and connecting it with Tofino inlet and Browning passage, is a winding channel about $1\frac{1}{2}$ miles long and 2 cables wide; the depths vary from 10 to 20 fathoms, and the tidal streams set with considerable strength through it. On its west side is a narrow creek half a mile long with from 8 to 9 fathoms, and in the middle of the pass is a small islet.

Tofino inlet, in the eastern part of Clayoquot sound, is about 10 miles long, and varies in breadth from a half to $1\frac{1}{2}$ miles; its shores are high and rocky, indented on the west side by some large creeks. The depths vary from 22 to 68 fathoms, and there is no anchorage, except near the entrance on the west side.

Island cove, half a mile West of Warn island, is of small extent, with from 8 to 10 fathoms in the middle, and completely landlocked; a small island lies off the entrance, with a clear passage one cable wide on either side of it into the cove.

Gunner harbour, on the west side of the inlet, just north of Warn island, is $1\frac{1}{2}$ miles long, but narrow: a small islet lies in its centre, about half a mile north of the entrance, and between them a vessel may find good anchorage in about 10 fathoms: the harbour becomes shoal towards the head.

Tranquil creek, on the west side of the inlet $4\frac{1}{2}$ miles north from Warn island, is narrow, and upwards of one mile long: its shores are high and rocky, and the creek is too deep for anchorage.

Between Tranquil creek and Warn island, along the west shore, are several small rocky islets, extending from 2 to 3 cables off.

Deer creek, one mile long and a quarter of a mile broad, has an inconvenient depth for anchorage, there being from 22 to 29 fathoms inside it.

Browning passage, on the south side of Meares island, connecting Tofino inlet with Templar channel, is 5 miles long in a westerly direction, and less than half a mile broad. Its east end is only $1\frac{1}{2}$ cables wide, and off the west entrance there are several rocks, and no stranger, except with a small vessel, should attempt it. The depths in it vary from 4 to 12 fathoms, and the tidal streams set through at a rate of 2 to 4 knots, the flood stream from the westward,

A rock, with a depth of 8 feet on it, $4\frac{1}{2}$ to 5 fathoms to the northward, and 2 to 4 fathoms to the southward, is situated northward of the islets at the eastern end of Browning passage. The fairway is on the northern side of the rock, and carries a depth of 5 fathoms. A red spar buoy marks the rock.

The passage southward of the islets it is recommended in preference to that to the northward.

North channel, to the westward of Ship channel, and separated from it by a number of small islands and rocks, lies along the south-east side of Flores island in a north-easterly direction. It is 4 miles long, half a mile wide in the narrowest part, and the depths in it vary from 7 to 17 fathoms; both sides of the channel are bordered by innumerable rocks, and a stranger is not recommended to use it, as it has not been closely examined; the sea generally breaks heavily along both sides of its outer part.

Flores island, in the western part of Clayoquot sound, between North channel and Sydney inlet, is nearly 7 miles in extent; it is low on the south and east sides, but high on the north and west, rising in some places to 3,000 feet; the shores are rugged and broken, and there are several off-lying rocks along its south and west sides; as a rule its outer part should not be approached nearer than 2 miles.

North arm, between the east sides of Flores island and the main, is about 8 miles long in a S.E. by S. direction, and nearly one mile broad. Its western shores are high, but decreases gradually to the southward; the depths are very great in the north part, but they shoal rapidly to the southward, where a vessel may anchor in from 5 to 8 fathoms abreast Base point.

Matilda creek, on the west side of North arm, abreast the entrance to Herbert arm, is $1\frac{1}{2}$ miles long in a S.S.E. direction, very narrow, with from 10 to 25 fathoms, but useless as an anchorage.

Herbert arm, the entrance to which is on the east side of North arm, about 2 miles from the south entrance of the latter, is 9 miles long, in a northerly direction, and its average breadth is about one mile. The shores are mountainous, and much broken.

Bawden bay, on the south side of entrance to Herbert arm, and about $1\frac{1}{2}$ miles S.E. of Cone island, is of small extent, and affords anchorage in 15 fathoms, near the centre; enter it in mid-channel.

White Pine cove, on the east side of Herbert arm, nearly 3 miles from the entrance, is small, with a bank extending from the head;

a small vessel may anchor close to the edge of this bank in about 10 fathoms; care, however, should be taken to avoid a shoal of 3 fathoms lying almost in mid-channel, at about 7 cables from the head of the cove.

Directions.—Entering Clayoquot sound by Ship channel (which latter will easily be recognised by Bare island, Sea Otter rock, and a remarkable summit inland, the Lone cone*), round either Bare island or Sea Otter rock at the distance of half a mile, and steer up the channel with the south point of Lawrence island and the Twins islets in line with the north summit of the Cat-face mountains bearing N.N.E.* Keep the above-mentioned mark on till within half a mile of the Shark reefs, when haul more to the eastward for the west extreme of Vargas island, which may be rounded at a distance of 3 cables. If going on through Hecate passage (page 335) into Hecate bay, to clear Half-tide rock keep Hobbs islet open west of Burgess islet bearing S. by W. $\frac{1}{2}$ W. until the Twins come in line with the west Whaler island bearing W. by S., when steer up the passage with that mark on astern, which will lead north of Half-tide rock and south of the North bank. When past the latter, steer through Deep pass, and anchor in Hecate bay midway between its entrance points in 9 or 10 fathoms.

During heavy south-westerly gales the sea is said to break right across Ship channel, between Lawrence and Hobbs islands.

Caution.—Although there are several apparently deep channels into Clayoquot sound, they are, with the exception of Ship channel, so tortuous and filled with rocks, that no stranger should attempt to enter by any except the latter, and not by it unless having the latest Admiralty chart of the sound. If the weather be clear, it will be easy to recognise Ship channel, but if in doubt, there will be little difficulty found in procuring a native off the entrance of sufficient intelligence to pilot a vessel in.

Intending to navigate the inner waters of the sound, which can only be done by a steamer or small craft, the chart will be found the best guide.

SYDNEY INLET, westward of Clayoquot sound, is 10 miles long in a N.N.W. direction, and varies in breadth from a half to one mile. Its entrance is $3\frac{1}{2}$ miles N.W. by N. from Rafael point, between the west side of Flores island and the mainland of Vancouver; at 4 miles from the head are two small branches about

* See chart, No. 584.

* See View D on Admiralty chart, No. 584.

2 miles in length, one extending north the other south-west; the shores are high and rugged, rising abruptly from the sea to 2,000 and 3,000 feet. The depth in the entrance is 15 fathoms, increasing gradually towards the head.

Refuge cove. just west of Sharp point, and separated from Sydney inlet by a narrow peninsula, extends $1\frac{1}{2}$ miles in a N.N.W. direction, is from one to 2 cables wide, and affords good anchorage in 4 to 5 fathoms at half a mile within the entrance, well sheltered and secure from all winds, though apparently open to the S.S.E.*

The entrance is narrow, and at 2 cables inside Sharp point and about one cable from the eastern shore is a rock having only 9 feet on it at low water. This rock lies slightly eastward of the fairway, but a good look out is necessary, as it is not always marked by kelp.

Canoe reef. lying just south-west from the entrance and three-quarters of a mile S.W. by W. from Sharp point, is 2 feet above high water, but steep-to on the south and west sides.

Directions.—Entering Refuge cove from seaward, bring the entrance or Sharp point to bear N.N.W. $\frac{1}{2}$ W., and steer for it, so as to pass one cable west of the point; then keep in mid-channel, or rather nearer the western shore, to avoid the 9 feet rock, having passed which keep close to the eastern shore and anchor in $4\frac{1}{2}$ or 5 fathoms, about 7 or 8 cables within the entrance.

A sailing-vessel, if embayed near this part of the coast, would find safety and shelter in Refuge cove.

Shelter arm branches off from the east side of Sydney inlet N.E., along the north side of Flores island for 4 miles, and then N.E. by N. for nearly the same distance, terminating in a narrow creek at the head.

The shores of Shelter arm are high, precipitous, and steep-to; the tidal streams run from one to 2 knots through it, the flood stream from the westward.

Steamer cove is the only anchorage (indifferent) in it, just 2 miles within the entrance on the north side of Flores island; it is a small bight where a vessel may anchor in 17 to 19 fathoms, passing on either side of the islet at its entrance.

Rocky pass is narrow, about $1\frac{1}{3}$ miles long, in an east and west direction, but filled with rocks, so that no vessel could get through it; the tide runs irregularly through, but seldom exceeds 4 knots.

See chart, No. 581.

* *See plan of Refuge cove on Admiralty chart, No. 581; scale, $m = 30$ inches.*

CHAPTER IX.

WEST COAST OF VANCOUVER ISLAND, FROM
CLAYOQUOT SOUND TO CAPE SCOTT.

VARIATION, 24 30 E. in 1898.

HESQUIAT HARBOUR, 8 miles westward of the west part of Clayoquot sound, is formed at the bottom of the bay on the east side of Estevan point. It is 4 miles long in a N.N.W. direction, and upwards of 2 miles wide at the entrance, opening out a little inside, but on nearing the head it contracts to less than one mile. The depths within the harbour vary from 4 to 8 fathoms, and there is a good and secure anchorage in 7 or 8 fathoms at half a mile from the head.*

Hesquiat is a large Indian village, and has a Roman Catholic mission establishment. The store is about one mile northward of the village on the western shore. The anchorage used by the sealers is off the store, off the village it is too rocky.

The bar.—Across the entrance, between Hesquiat bluff and Estevan point, is a bar or ledge, about 3 cables wide, with from 3 to 5 fathoms water over it, which in a great measure prevents the sea from setting home into the harbour. Kelp grows more or less all over the anchorage in a depth of 5 fathoms.

Hesquiat bluff is a remarkable, low, wooded point, with a shingle beach around it; a reef, which covers at a quarter flood, lies half a mile S.W. from it.

The shores of the harbour are mostly low and wooded, and within the entrance, at a distance of 2 cables, clear of danger. On the west side of the bay near Estevan point are several indications of coal, and the land is apparently fertile.

* See Admiralty chart:—Esperanza to Clayoquot sound, No. 569; scale, $m = 0.5$ of an inch. Also, plan of Hesquiat harbour on same chart; scale, $m = 1.5$ inches.

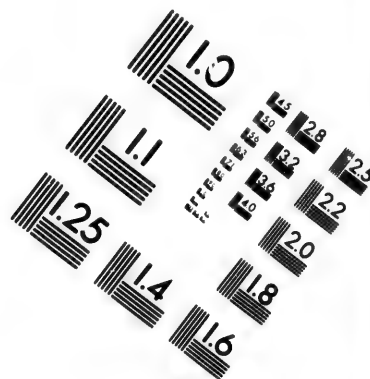
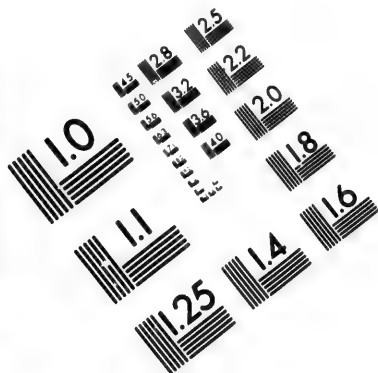
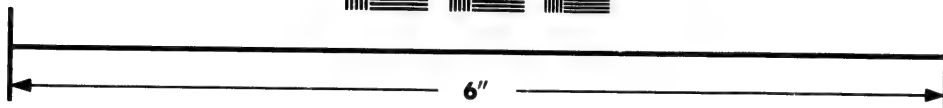
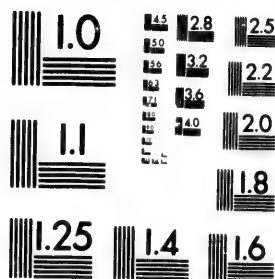


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Boat basin is a small cove with 4 fathoms at the head of Hesquiat harbour on the east side; there is a large fresh-water stream there, and vessels may obtain wood and water with great facility.

Directions.—Hesquiat harbour is easy of access to sailing-vessels, even with a foul wind. The notch of Leading mountain in line with East Entrance point (not Hesquiat bluff), bearing N.N.W., leads over the bar in $4\frac{1}{2}$ fathoms at low water. Entering either from the east or west give the outer shores of the harbour a berth of more than half a mile, till past the bar; anchor in 7 or 8 fathoms near the centre of the harbour, about half a mile from its head.

In strong south or south-westerly gales the sea breaks heavily over the bar, but the anchorage is always safe, and landing is at all times practicable in Boat basin.

Tides.—It is high water, full and change, in Hesquiat harbour at noon; springs rise 12 feet.

ESTEVAN POINT, 13 miles W. $\frac{1}{4}$ N. from Rafael point, is a low, wooded and projecting point, bordered by a sandy beach, strewn with huge boulders. A ledge extends nearly one mile off its south-west side. Hole in the Wall, the south part of the point, may be easily known by a remarkable gap in the trees at its extreme, which is conspicuous from the south-west.

When rounding the west part of Estevan point, it would not be prudent to approach the shore within 2 miles.

From this point the coast takes a N.N.W. direction for 8 miles to Escalante point at the entrance of Nootka sound, and is low, foul ground existing off it for some distance.

Estevan point is situated in latitude $49^{\circ} 22' 0''$ N., longitude $126^{\circ} 32' 0''$ W.

Sunday rock lies $1\frac{1}{4}$ miles distant from the shore, and nearly 3 miles W. $\frac{1}{4}$ N. from Hole in the Wall, the pitch of the point; within the ledge good shelter will be found for boats in all weathers.

NOOTKA SOUND, called King George sound by the celebrated navigator, Captain James Cook, in 1778, was of considerable political importance in former years, is a large sheet of water upwards of

6 miles in extent, containing several islands, and from its north side three narrow arms penetrate the land for distances of 18, 7, and 14 miles respectively. Its entrance is 5 miles wide between Maquinna and Escalante points, which bear W. by N. and E. by S. from each other; at the entrance the shores are low, and have several off-lying dangers, but inside the sound they become high, rugged, and precipitous.*

In fine weather, the natives will be met with in canoes, in considerable numbers on the banks, fishing for halibut, which are very plentiful along this coast.

There are four anchorages in the sound, two of which, Friendly cove and Plumper harbour on the east side of Nootka island, are small though easy of access to steam-vessels; the former is one, and the latter 7 miles within the entrance; the others in the Tlupana arm, though well sheltered, are more inconvenient, being 13 and 16 miles from the entrance.

Aspect.—From seaward the appearance of the land near the entrance of the sound offers to the navigator many striking features which in fine weather render it almost impossible to be mistaken; the low land of Estevan and Maquinna points at the entrance, with the breakers off them, the Nootka cone at the east point of Nootka island, and if coming from the South or S.S.W., Conuma peak, a remarkable steeple-shaped mountain, 4,889 feet high (page 349), is a most conspicuous feature.

Tides.—It is high water, full and change, in Nootka sound, at noon, and the rise and fall is about 12 feet; the tidal streams are everywhere inconsiderable.

Escalante point, the eastern entrance point of the sound, is low and rocky; some small islets, and rocks generally above high water, extend off it in a westerly direction for upwards of one mile, but they are steep-to on their outer edge. At their outer end is a rock only uncovering at low water.

From Escalante point to Burdwood point at the narrowest part of entrance on the east side, the coast, which still keeps a N.N.W. direction for 3 miles, is bordered by several off-lying rocks, and should not be approached within one mile until close to the latter point.

* See Admiralty plan:—Nootka sound. No. 1,916; scale. $m = 2.0$ inches.

Maquinna point, the west entrance point of the sound, is low and wooded, and at its extreme is a remarkable bare-topped conical rock about 60 or 70 feet high ; some rocks extend 3 cables off it in an easterly direction, also along the coast from it to the eastward nearly as far as the entrance of Friendly cove, and the shore should not be approached nearer than three-quarters of a mile, till near the latter place.

Bajo reef, 6 miles S.W. by W. $\frac{1}{4}$ W. from Maquinna point and $2\frac{3}{4}$ miles distant from the shore, is about 2 cables in extent, and the sea only breaks on it in heavy weather. This reef is the only known hidden danger outside the sound, and is dangerous to vessels entering it from the westward. Yuquot point, the east extreme of Nootka island, kept open east of Maquinna point, bearing N.E. $\frac{1}{4}$ E., leads $1\frac{1}{2}$ miles south-east of it ; and Bight cone (a remarkable hill on the south side of Nootka island) kept well open west of Bajo point bearing N. by W., leads $1\frac{3}{4}$ miles west of the reef.

FRIENDLY COVE, at the east extreme of Nootka island, just within the narrowest part of the entrance to the sound and about $2\frac{1}{2}$ miles north-east of Maquinna point, is about 2 cables in extent and sheltered from the sea by several small rocky islets on its south-east side. The entrance, one cable wide, is from the north-east. The shores on both sides of the cove are rocky and about 60 feet high on the north side, but at the head is a small space of clear, cultivated flat land, around which in the summer the natives build an extensive village (Yuquot). There is a store at the northern end of the village.*

Anchorage in Friendly cove, in from 5 to 9 fathoms, is of small extent, affording only room for one vessel of moderate size to lie moored in the middle, though several small ones would find shelter

Directions.—If desiring to anchor in Friendly cove, round Observation islet, the east entrance point, close to, and if in a large vessel moor with anchors S.S.W. and N.N.E., letting go the first immediately on entering the cove. Sailing-vessels, unless with a fair wind, would find some difficulty in entering ; and if unable to shoot in, it would be preferable to warp or proceed further up the sound to Plumper harbour.

* See plan of Friendly cove on Admiralty chart. No. 1,916 ; scale, $m = 11\cdot8$ inches

Supplies.—Fresh water in quantity cannot be procured at Friendly cove, or nearer than Marvinas bay; but fish and deer may generally be obtained in large quantities from the natives.

Marvinas bay.—The west shore of Nootka sound from Friendly cove trends in a N.N.W. direction for about 6 miles to the entrance of the Kendrick arm and Tahsis canal; it is rocky, and near the south part some islets lie parallel to it, extending for nearly 2 miles, distant about 3 cables from the shore. There are two small creeks with entrances too narrow for a vessel to enter; the northernmost of them named by the Spaniards Boca del Infierno, lies abreast the north part of the above-mentioned islands, and $1\frac{3}{4}$ miles from Friendly cove. Marvinas bay, 4 miles N.N.W. from Friendly cove, on the east side of Nootka island, is of small extent and open to the southward; it only affords anchorage to a coaster.

Water.—There are large fresh-water streams at the head of Marvinas bay, and just south of it, convenient for watering.

Kendrick arm, at the west end of Nootka sound between Nootka and Narrow islands, is about 5 miles long in a north-westerly direction, and half a mile wide, connected at the north part by a narrow boat pass to the Tahsis canal; on the west side, 2 miles from its south part, is Plumper harbour, easy of access, and well sheltered. Northward of this harbour the shores of the arm on both sides are rocky, terminating in two narrow creeks at the head, useless for purposes of navigation.

PLUMPER HARBOUR, on the west side of Kendrick arm, and 6 miles from Friendly cove, is a small bay indenting the east side of Nootka island, about 3 cables in extent and affording good anchorage in 12 fathoms. It is protected on the east side by two small wooded islets from 30 to 40 feet high; on the west side the shore is rather swampy, and there are several fresh-water streams.

Anchorage.—There is a clear passage into the harbour between the two islets, or to the northward of the north one, which may be rounded at the distance of one cable, and there is room for a vessel to lie at single anchor inside; it is the best anchorage in the sound, the only drawback being its distance from the entrance.

Tahsis canal, the entrance to which is at the north-west part of Nootka sound, about 6 miles from Friendly cove, is a long narrow

arm of the sea, nearly straight, and 14 miles long in a N.W. by N. direction; the shores are mountainous, rocky, and steep to, and there is no anchorage in it. In many parts this canal is only 2 cables wide, but it becomes gradually broader at the head, where is a large stream, and also a considerable village, to which the natives resort during the summer season for salmon, which are caught here in great plenty.

At $10\frac{1}{2}$ miles from the entrance of the canal on the west side, and separating the north point of Nootka island from the main of Vancouver island, are the Tahsis narrows, one cable wide, with 28 fathoms in the centre; they connect Esperanza inlet with the Tahsis canal; the tidal streams run weakly through them, the flood from the westward.

At the entrance of Tahsis canal is a small island with a clear passage about one cable wide on both sides of it.

Bligh island, lying in the centre of Nootka sound, is the largest island in it, being about $4\frac{1}{2}$ miles long in a northerly direction, and 2 miles wide in the northern part; its shores are rocky, and indented by creeks on the southern side. Its south extreme is a long narrow point about 3 miles north-east of the entrance to the sound, and off its south and west sides are a number of islands extending upwards of one mile from it, all steep-to on their outer edges, but among which no vessel should venture. The south part of the island is rather low, but it rises in the north and west parts to 1,030 and 1,200 feet.

Resolution cove, at the south-east point of this island, just within the entrance of the Zuciarte channel, is only deserving of notice as the spot where Captain Cook refitted his ships in April 1778; it is only a slight bend in the coast, with a deep and rocky bottom, and inconvenient for anchorage, being also open to the south-west.

Junction island, lying about midway between the south-east point of Narrow island and west side of Bligh island, is about half a mile long and 250 feet high; a small islet lies close off its north-west side and another on the opposite side. The channel lies to the west and north of Junction island, and no vessel should pass between the latter and Bligh island.

Zuciarte channel, between the east shore of Nootka sound and Bligh island, is about 5 miles long in a northerly direction, and upwards

of half a mile wide in the narrowest part; its shores are high, and the depths within the channel varying from 80 to 100 fathoms.

Guaquina, or Muchalat arm, extends 17 miles in an E.N.E. direction from the north-east part of Nootka sound, and varies in breadth from a quarter to upwards of one mile. It is bounded on both sides by mountains from 2,000 to 4,000 feet high, and presents similar features to the inlets before described along this coast, terminating in low land at the head, through which a small stream flows into the inlet; there is no anchorage whatever within this arm except for coasters.

One and a half miles within the entrance is Gore island, which is narrow, and about 3 miles long, in an E.N.E. direction; there is a clear, deep passage on either side of it, the southern one being less than one cable wide at the east part. The land rises in the centre to 1,200 feet, sloping gradually to each end; its shores are rocky.

On the north side of this arm, 14 miles within the entrance, is an extensive valley, through which flows a large stream, named the Gold river, indications of that metal having been discovered there; the land in the vicinity of this stream is lightly timbered and very fertile; a small vessel may enter it at high water.

The Muchalat Indians have a village at the mouth of Gold river.

TLUPANA ARM, the entrance to which is in the north part of Nootka sound, is about 7 miles long in a northerly direction, branching off at the head in two smaller arms extending to the north-west and north-east, the former about 3 miles, the latter 2 miles long, and each terminating in low land. Its shores are high and rocky, and the depths in it vary from 80 to 100 fathoms; there are two anchorages one at Deserted creek on the west side, and the other at Head bay, the termination of the north-west branch.

The mountains at the north part of this arm are the highest in the sound, many being from 4,000 to 5,000 feet above the sea; Conuma peak, rising 7 miles north-east from the head, is 4,889 feet high, and of a steep shape.

Deserted creek, on the west side of the arm 3 miles within the entrance, is 2 miles long in a westerly direction and about 2 or 3 cables wide; a vessel may anchor in 12 to 14 fathoms at one third of a mile from its head. Island bay, a small cove on its north-east

side, just within the entrance, has an islet in the centre, to the westward of which is room for a vessel to anchor in 12 fathoms.

At the southern extreme of the promontory separating the two branches at the head of Tlupana arm is Perpendicular bluff, a remarkable precipice of considerable height.

Head bay, the termination of the western branch of the Tlupana arm, is nearly one mile long in a westerly direction, about 4 cables wide, and affords anchorage in from 14 to 16 fathoms at the distance of 3 or 4 cables from its head. At the entrance on the north side are three small islets about 3 or 4 feet above high water, the inner one connected to the shore by a beach at low water; between these islets and Perpendicular bluff is a small bay, where a vessel may anchor in from 16 to 18 fathoms.

Directions.—Entering Nootka sound from the southward, after rounding Estevan point steer about N.N.W. for the entrance, which will be easily made out by the rocks off Escalante and Maquinna points; keep about 2 miles off the eastern shore till past Escalante point, when steer up mid-channel into the sound. If bound to Friendly cove haul over to the west side of entrance for Yuquot point, which may be approached within a distance of one cable, and rounding it sharply, anchor or moor, as most convenient, in Friendly cove in from 5 to 9 fathoms.

If bound to Plumper harbour, after passing Yuquot point keep about half a mile from the north-east side of Nootka island, on a N.N.W. or N. by W. course for 5 miles to the entrance of the Kendrick arm, when steer up the latter in mid-channel till abreast Plumper harbour, which may be entered by passing between Bold and Pass islets on its east side, or going to the northward of the former; anchor in 11 to 12 fathoms near the centre of the harbour.

Should it be desired to anchor in any of the anchorages within the Tlupana arm, steer as before directed till within half a mile of the entrance to the Kendrick arm, when haul to the north-east, pass to the westward of Junction and Bligh islands, and steer up the Tlupana arm, in mid-channel, or close to on either shore. Deserted creek and Head bay may be entered without difficulty.

Entering Nootka sound from the westward, on nearing Bajo point do not approach the south shore of Nootka island within 4 miles, or shut in Bight cone with Bajo point bearing N. by W., until Yuquot

point opens east of Maquinna point bearing N.E. $\frac{1}{4}$ E., which will clear the Bajo reef; a vessel may then steer for the entrance of the sound, about N.E. by E., not approaching the shore between Maquinna and Yuquot points nearer than one mile, until abreast the latter, after which proceed up the sound as before directed.

If beating into Nootka sound, when standing to the westward, keep Yuquot point open east of Maquinna point bearing N.E. $\frac{1}{4}$ E., which will keep a vessel well clear to the eastward of Bajo reef; in standing to the eastward do not approach Escalante point within $1\frac{1}{2}$ miles, nor bring Burdwood point to bear northward of N. by E. until abreast it, when standing towards Maquinna and Yuquot points on the west side, avoid bringing the latter to bear to the eastward of N.N.E. until abreast it.

Nootka sound is easier of access than any other place on the whole of the west coast of Vancouver island, the entrance being nearly 2 miles wide in the narrowest part; and by attending to the above directions any sailing-vessel may beat in or out of the sound. If, and provided with a chart, the night be clear, it may be entered without risk by bringing the entrance to bear N.N.E., and in a steamer but little difficulty would be experienced in picking up the anchorages of Friendly cove and Plumper harbour.

NOOTKA ISLAND, which bounds the west side of Nootka sound, is of considerable extent, being 15 miles long in a northerly and 20 miles in a westerly direction. Its south, or outer shore is low, rising gradually inland 1,500 and 2,900 feet above the sea, and has a beautiful and fertile appearance; it is bordered by a sandy beach nearly the whole distance, and the sea breaks heavily along it.*

Bajo point, 6 miles west from Maquinna point, is low and rocky. A ledge named the Inner Bajo reef extends $1\frac{1}{4}$ miles from it in a southerly direction; and the Bajo reef (*see* page 346) lies $2\frac{3}{4}$ miles S.S.E. from it.

Westward of Bajo point the coast takes a W.N.W. direction for 10 miles to Ferrer point, and is slightly indented. Bight cone, a remarkable summit, 540 feet high, rises 3 miles N.N.W. $\frac{1}{2}$ W. from Bajo point, and is about one mile inland.

When navigating along the south side of Nootka island west of the Bajo reef, it would not be prudent to approach the shore within

2 miles, until near Ferrer point, though there are no known outlying dangers.

NUCHATLITZ INLET, on the north-west side of Nootka island, about 18 miles W. by N. from the entrance to Nootka sound, is 6 miles long in a north-easterly direction, and 3 miles wide at entrance, narrowing towards the head; its shores are high and rocky, and much broken into creeks and small bays; off the entrance, and within are several dangers. The depths in the inlet vary from 5 to 17 fathoms, and there are two good anchorages, port Langford on the north side, and Mary basin at the head; but owing to the dangers off the entrance of the inlet, they are both rather difficult of access.*

Caution.—None but small vessels should attempt to beat into this inlet, as there is generally a heavy sea at the entrance, and no stranger should attempt to enter unless the leading mark is easily distinguished.

Ferrer point, the south entrance point of the inlet, is low and rocky; there is a depth of 14 fathoms at 2 cables from it, and half a mile eastward of the point is North-west cone, a very remarkable conical hill 350 feet high, which proves a very useful guide to this locality from the westward.

Danger rock, lying in the south part of the entrance, upwards of one mile N.W. $\frac{1}{2}$ W. from Ferrer point, is the worst danger, as it is of very small extent, and the sea only breaks on it in heavy weather; it is steep to on all sides, there being 11 fathoms close to it. The best passage into the inlet is between this rock and Ferrer point.

Mark hill, at the head of inlet, in line with the north part of Fitz island, bearing N.E. $\frac{1}{2}$ E., leads south of this rock midway between it and Ferrer point, and through the fairway into the inlet.

Nuchatlitz reef, in the centre of the entrance and one-third of a mile north of Danger rock, is about three-quarters of a mile long in an E.N.E. and W.S.W. direction, and one cable wide. The sea generally breaks on this reef, and at its eastern extremity is a small rock awash at high water; there is a passage between it and Danger rock, and also apparently northward of it, but neither should be attempted by a stranger, as no leading marks can be given for them.

* See Admiralty plan:—Esperanza and Nuchatlitz inlets. No. 589; scale $m = 2.0$ inches.

South reef, nearly 2 cables in extent and covering at three-quarters flood, lies just within the entrance on the south side, one mile N.E. by N. from Ferrer point, and about 3 cables distant from the shore.

Mark hill, in line with the north summit of Fitz island, bearing N.E. $\frac{1}{2}$ E., leads 2 cables north of this reef.

Louie creek, just inside South reef, is shoal, and nearly one mile in extent; there are several rocks off its entrance, and no vessel should enter it: to the eastward of the creek the south shore of Nuchatlitz inlet is rocky.

Fitz island, in the centre of the inlet, and 3 miles from the entrance, is of small extent, low, rugged, and covered with a few stunted pine trees, the tops of which are about 100 feet above the sea. At half a mile West of it is Bar island, small and 20 feet high; between the rock and Fitz island foul ground exists. Bare rock, of small extent, and 12 feet above high water, lies three-quarters of a mile S.W. of Fitz island.

Mary basin, the termination of the inlet, is of considerable extent, and completely landlocked by Lord island, which lies across the inlet at the south-west part of the basin. The depths inside the basin vary from 5 to 9 fathoms, and the entrance on the north side of Lord island appears clear of danger, but it has not been sufficiently examined to recommend its being used by a stranger.

Eastward of Mary basin, and connected to it by a narrow pass 50 yards wide, with from 7 to 9 fathoms, is Inner basin, a sheet of water upwards of 3 miles long in an easterly direction, with from 20 to 39 fathoms, and apparently useless as an anchorage.

Port Langford, on the north side of Nuchatlitz inlet, 2 miles within the entrance, is about $1\frac{1}{4}$ miles long in a north-westerly direction, and varies in breadth from a quarter to half a mile. The depths in it vary from 5 to 8 fathoms, and it affords a secure and well-sheltered anchorage in about 6 fathoms, muddy bottom, at half a mile from the head. The east shore of the port is high, rising to Mt. Rosa 2,553 feet above high water, but the western shore is much lower; both are rocky.

Colwood islet, at the south-west extreme of the entrance, is small, and bare, 20 feet high, and nearly half a mile off shore;

inside it, and to the westward round the north entrance point of Nuchatlitz inlet, are innumerable rocks and small islets, among which no vessel should venture.

Belmont point, the east entrance point into port Langford, is two-thirds of a mile N.E. $\frac{1}{2}$ E. from Colwood islet; it is low, and a rock uncovers at one cable west of it.

Directions.—Entering Nuchatlitz inlet from the southward bring Ferrer point on a N. by W. bearing, and steer to pass half a mile west of it; and when Mark hill comes in line with the north part of Fitz island N.E. $\frac{1}{2}$ E., haul in for the entrance on that mark, which will lead in clear of Danger rock and South reef. When Ferrer point bears South, a vessel will be inside the rock, and may steer N.N.E. for the entrance to port Langford; pass midway between Colwood islet and Belmont point, and proceed up the port in mid-channel, anchoring in 5 or 6 fathoms, at half a mile from the head.

Approaching the port from the westward, keep an offing of 4 or 5 miles till Ferrer point bears East, when steer for it on that bearing till the leading mark for the channel (Mark hill in line with the north part of Fitz island N.E. $\frac{1}{2}$ E.) comes on, when proceed as before directed to the anchorage in port Langford.

Intending to enter Mary basin (which is not however recommended), when past Ferrer point keep the leading mark on till abreast Louie creek, then steer a little to the eastward, passing about one cable south of Fitz island and Bare rock (south-west of it); when past the former steer N.E. by E. $\frac{1}{2}$ E. until the west point of Lord island bears N. by E., which will clear the shoal extending half a mile to the southward from Benson point, and then, on approaching Lord island, borrow a little towards the north shore and enter Mary basin to the westward of the island and the small islet north-west of it; when abreast the latter haul more to the eastward and anchor in from 5 to 6 fathoms near the middle of the basin.

Tides.—It is high water, full and change, in Nuchatlitz inlet at noon; springs rise about 12 feet.

ESPERANZA INLET, the entrance to which lies between the north-west side of Nootka island and the main land of Vancouver island, 122 miles W. by N. $\frac{3}{4}$ N. from the lighthouse on Tatoosh island, is about 16 miles long in a winding north-easterly direction,

with an average breadth of about one mile, narrowing at the head, and connected by a narrow pass (Tahsis narrows) to the Tahsis canal in Nootka sound.*

The entrance, though wide, contains several dangers; inside the shores rise on both sides to mountains of considerable height. The southern shore is indented by three bays of moderate extent, which, however, afford no anchorage; and from the northern one three arms of considerable length penetrate the Vancouver shore for several miles in a N.N.W. direction. Port Eliza, in the western arm, has the only anchorage in the inlet.

Middle channel, the widest and best into Esperanza inlet, is 3 miles long in a northerly direction, and upwards of one mile wide in the narrowest part. Its entrance lies 3 miles W.N.W. from Ferrer point, between Blind reef, Needle rock, and a number of small islets extending off the north-west point of Nootka island on the east, and Middle reef and Black rock on the west; a part of the former is always above water.

Blind reef, at the south-east extreme of the channel, 3 miles N.W. $\frac{1}{2}$ W. from Ferrer point, is about 2 cables in extent, and the sea only breaks on it in bad weather; one cable North of it is a small rock, and at a distance of 2 cables from its south and west sides are depths of 13 to 19 fathoms.

Pin rock, of small extent, awash at low water, lies two-thirds of a mile East from Blind reef.

Needle rock, which is of small extent, lies two-thirds of a mile North of the Blind reef, and has from 14 to 15 fathoms at 2 cables west of it.

Middle reef, at the south-west entrance point of Middle channel, is about 3 cables long in a northerly direction, and one cable wide. The sea generally breaks on this reef, and at its south extreme is a small rock 4 feet above high water; there are from 5 to 20 fathoms at the distance of one cable on all sides of it; its south part lies 4 miles N.W. by W. $\frac{3}{4}$ W. from Ferrer point.

Leading hill in line with Black rock bearing N. by W. leads through the fairway of Middle channel two-thirds of a mile west of

* See Admiralty plan:—Esperanza and Nuchatlitz inlets No. 589; scale, $m=2.0$ inches.

Blind reef, one mile west of Needle rock, and half a mile east of Middle reef.

North channel leads into Esperanza inlet west of Middle reef, between it and the dangers off the south-east point of Catala island. It is about one-third of a mile wide, and upwards of 2 miles long.

Black rock in line with Double island bearing N. by E. $\frac{3}{4}$ E. leads in through the fairway of North channel clear of Middle reef.

CATALA ISLAND, $5\frac{1}{2}$ miles N.W. $\frac{1}{2}$ W. from Ferrer point, on the west side of the entrance to Esperanza inlet, is about $1\frac{3}{4}$ miles long in a westerly direction, and one mile wide in its broadest part. It is wooded and from 150 to 200 feet high, its shores are rocky, and several dangers exist at a considerable distance off it on all sides; its north side is separated from the Vancouver shore by a passage half a mile wide, named Rolling roadstead, and a vessel may find a tolerably secure anchorage there in from 4 to 6 fathoms, though generally a swell prevails in it.

The Twins, two small islets connected with each other at low water, lie off the south point of Catala island, and foul ground extends nearly $1\frac{1}{2}$ miles south from them, terminating in Low rock 6 feet above high water.

Black rock, which lies 4 cables S.E. from the east point of Catala, is a small bare rock 20 feet above high water; foul ground exists between it and Catala, and also one cable south of it; do not approach its eastern side nearer than 2 cables, nor attempt to pass westward of it.

Entrance reef, about 3 cables north of the east point of Catala island at the eastern part of Rolling roadstead, is of small extent, and covers at half flood.

Arnold rock, half a mile north from Entrance reef, and about 2 cables distant from the opposite shore, is awash at high water; midway between these rocks are $6\frac{1}{2}$ fathoms, and in the roadstead from 4 to 6 fathoms. The outer rocks off the north-west part of Catala island, open north of the low grassy point at the north side of the latter, bearing W. by S., leads into Rolling roadstead, midway between the Arnold rock and Entrance reef.

Half a mile inshore, and overlooking the north-east part of Rolling roadstead, is Leading hill, 1,104 feet above the sea; it is of conical shape, and conspicuous from the entrance to Middle channel.

Double island lies half a mile from the west shore at the inner and narrowest part of the entrance to Esperanza inlet. It is of small extent, and wooded; a number of rocks exist between it and the shore.

Flower islet, on the opposite shore, one mile E.S.E. from Double island and half a mile from the north-west point of Nootka island, is small and bare, and is the northernmost of the islets off Nootka island between the entrances of Nuchatlitz and Esperanza inlets. At 2 cables S.W. from it is a small rock 2 feet above high water.

Eastward of Flower islet the south shore of Esperanza inlet takes a winding irregular outline to the E.N.E., is everywhere steep-to, and rises gradually to mountains 2,000 and 3,000 feet high. There are three bays, all too deep for anchorage; in the western one, which is just within the entrance, are several small islets.

Centre island, half a mile off the south shore, and about $1\frac{1}{2}$ miles north-east of Flower islet, is about three-quarters of a mile long in an east and west direction, and of moderate height; its shores are rocky.

Hecate channel, near the head of the inlet, is $4\frac{1}{2}$ miles long in a winding direction to the eastward, and its average breadth is about 6 cables. The western end is 8 miles from the entrance of Esperanza inlet; and the eastern (Tahsis narrows) is about one cable wide, with 28 fathoms, connecting this channel with the Tahsis canal in Nootka sound; the shores are high and rocky.

PORT ELIZA, the entrance to which is on the north side of Esperanza inlet, one mile north-east of Double island, is a narrow arm $5\frac{1}{2}$ miles long in a N.W. direction, its breadth varying from 2 to 4 cables; the shores are high, and there are some rocks and small islands in the entrance, and along the eastern shore. There is good anchorage in from 14 to 15 fathoms at half a mile from the head, and also in Queen's cove, which is upwards of one mile within the entrance on the east side.

The head terminates in a small patch of low swampy land, through which flow two fresh-water streams, and off it a bank dries one cable at low water.

The passage into port Eliza is through Birthday channel, eastward of Harbour island, and is 2 cables wide in the narrowest part.

Harbour island, in the centre of the entrance, is about 4 cables in extent, wooded, and of moderate height. Between Harbour island and the west shore lies False channel, which has irregular soundings, and in its south part are two rocks which cover at half flood.

Fairway island, on the east side of Birthday channel, and 4 cables east from Harbour island, is of small extent, and covered with a few stunted trees; some rocks extend a short distance off around it, the eastern ones being about 6 feet above high water.

Channel reef, half a mile N.N.W. of Harbour island, in the middle of port Eliza, is about one cable in extent, and covers at three-quarters flood.

Queen's cove, on the east side of the port, about $1\frac{1}{2}$ miles from the entrance, is 5 cables long, and 2 cables wide, but at the entrance the width is contracted to half a cable by a small island, which at low water is connected to the eastern side of the cove. The channel lies to the westward of the island.*

The cove affords room for a large vessel to lie moored in the centre in from 6 to 7 fathoms. Its shores are high and rocky, and it is completely land-locked, but it is easy of access for a steamer; a large sailing-vessel would, however, be most likely obliged to warp in; there is a fresh-water stream of considerable size on the west side of its head, very convenient for watering.

ESPINOSA ARM, the entrance to which is 2 miles north-east of port Eliza, is 8 miles long in a N.N.W. direction, and its average breadth is half a mile. The soundings within it are deep, and it affords no anchorage; at the entrance, on the west side, are some small islets, and a rock which uncovers. This inlet presents similar features to the other inlets along the coast, being bounded by high, rocky, rugged shores, and terminating in low land at the head. At 4 miles within the entrance, on the east side, is a narrow branch or

* See plan of Queen's cove on Admiralty chart, No. 589; scale, $m = 2.0$ inches.

fork extending 3 miles north-east to its head, which is separated by a narrow neck 3 cables wide from the Zeballos arm, forming a peninsula of considerable size to the southward. The entrance to this narrow branch is choked up with rocks.

ZEBALLOS ARM, the entrance to which lies 10 miles within the inlet, at the west end of Hecate channel, is about 6 miles long in a winding direction to the north-west, and about two-thirds of a mile wide; similar to Espinosa arm, it offers no anchorage whatever, and is of no use to the navigator.

Directions.—A stranger entering Esperanza inlet from the southward, through the Middle channel, and intending to anchor in port Eliza, should pass Ferrer point at a distance of about 3 miles, and keep on a northerly course till nearing the entrance to Middle channel, when steer to bring Leading hill in line with Black rock bearing N. by W., which will lead through the fairway, and clear of the dangers on both sides of the channel. When the south point of Catala island bears W.N.W., a vessel will be inside the dangers at the entrance, and should steer about N.N.E. for the entrance to port Eliza.

When entering the port steer through Birthday channel, passing one cable east of Harbour island; when past the east point of the latter, keep about N.W. by N. for the entrance to Queen's cove, or further over to the eastern shore, to avoid Channel reef; when entering the cove, pass west of the island at its entrance and moor.

If going to the head of port Eliza, keep on as before directed till within one cable of Queen's cove, when haul sharply to the westward, keeping about one cable from the east shore, till Fairway island comes in line with the east point of Harbour island bearing S.E. by E., when the vessel will be past Channel reef, and may steer up the port in mid-channel, anchoring near the centre, about 4 or 5 cables from the head, in 15 or 16 fathoms.

No large sailing-vessel should attempt to enter port Eliza unless with a steady fair wind.

Entering Esperanza inlet from the westward, keep an offing of $2\frac{1}{2}$ or 3 miles from Catala island (if Kyuquot hill be made out, by keeping it open west of Tat chu point N.W. by W., a vessel will be well clear of any dangers off Catala island), till Double island comes in line with Black rock bearing N. by E. $\frac{3}{4}$ E., and enter the inlet

through the North channel with this mark on, which will lead in. When the Twins islets bear N.W. by W., haul more to the eastward, passing a quarter of a mile outside the Mid and Black rocks, and steer for port Eliza as before directed.

If the weather be clear and the marks can be made out, both North and Middle channels are equally good, the latter being wide enough for a vessel to beat through, though it would be hazardous for a stranger to attempt, as no turning marks can be given.

Generally a heavy swell prevails off the entrance to Nuchatlitz and Esperanza inlets, and no sailing-vessel should attempt to enter, or leave either of them, unless with a steady fair, or leading wind.

Tides.—It is high water, full and change, in Esperanza inlet, at noon; springs rise 12 feet.

The COAST, westward of Catala island to Tat chu point, takes a westerly direction for upwards of 3 miles, is indented by two small sandy bays, and bordered by a number of rocks, some of which extend nearly 2 miles off shore. Tat chu point is clifty; some rocks lie a short distance to the southward of it, and there is a native village of considerable size at half a mile east of it. Eliza dome, a remarkable mountain, 2,819 feet above the sea, rises $1\frac{1}{2}$ miles N.N.W. of the point, and is very conspicuous from seaward.*

From Tat chu point the coast turns W.N.W. for 7 miles to the entrance of Kyuquot sound, and is indented by several small bays, in some parts of which boats may find shelter.

BARRIER ISLANDS.—At 2 miles westward of Tat chu point is the commencement of a chain of small islands and reefs bordering the coast of Vancouver island for nearly 20 miles in a westerly direction to the entrance of Ou ou kinsh inlet. They extend in some parts as far as 5 miles off shore, and through them are two known navigable channels, the Kyuquot and Halibut, leading to anchorages; the former channel leads into Kyuquot sound, and the latter into Clan ninick harbour; but as a rule no stranger should venture in the channels among these islands, unless the weather be clear, or without a pilot.

In thick weather do not stand nearer the Barrier islands than into a depth of 40 fathoms.

* See Admiralty chart :—Quatsino to Esperanza, No. 583; scale, * = 0.5 of an inch.

Highest island, one of the Barrier group, lying 2 miles south of Union island, is a remarkable bare rock 98 feet high, and useful in identifying the Kyuquot channel.

KYUQUOT SOUND, the eastern entrance to which is 12 miles from Esperanza inlet, is a large broken sheet of water penetrating from the coast to a distance of 14 or 15 miles inland in two large arms, and several smaller ones. Union island, 1,484 feet high, lying at the entrance, forms on either side of it a channel into the sound, the eastern one only being fit for large vessels; there are several islands within, mostly small; its shores are mostly rocky and very much broken, rising to high mountains, 2,000 and 4,000 feet above the sea.*

There are three anchorages, Narrowgut and Easy creeks, and Fair harbour, the two latter being of considerable size, but are 13 and 10 miles respectively from the entrance; the former, though very small, is 5 miles within the sound.

Kyuquot channel leads into the sound through the Barrier islands, and eastward of Union island. It is nearly straight, about 5 miles long in an N.N.E. direction, and about three-quarters of a mile wide.

East Entrance reef, one of the Barrier group lying at the south-east extreme of the channel, is about 2 cables in extent and 4 feet above high water; no vessel should stand inside it, nor, when entering the channel, round the reef nearer than half a mile.

Rugged point, the east entrance point to Kyuquot sound, is upwards of 2 miles north of East Entrance reef; it is rugged and rocky, but steep-to on the west side; between it and East Entrance reef are a number of rocks, among which no vessel should venture. The east side of the channel northward of this point is slightly indented and steep-to, to the termination of the channel.

Vest rocks, at the south-west extreme of Kyuquot channel and 2 miles N.W. $\frac{1}{2}$ W. from East Entrance reef, are two in number, the higher being 50 feet above high water; some rocks which cover at a quarter flood extend half a mile S.E. from them, with 20 fathoms close to their outer edge. When navigating the channel do not approach West rocks within two-thirds of a mile.

* Admiralty plan of Kyuquot sound, No. 717; scale, 1" = 1½ inches.

White Cliff head, the south-east extreme of Union island, is one mile N.E. by N. of West rocks, and abreast Rugged point; it is about 70 feet high, faced to the southward by a remarkable white cliff. Half a mile N.N.W. of the head is Kyuquot hill, remarkable, 740 feet high, bare of trees on its east side, and very conspicuous from seaward.

Chatchannel point, the north-west extreme of Kyuquot channel and the east point of Union island, is a low rocky point with a remarkable nob just inside it; a rock which covers at a quarter flood lies 2 cables east of it, and the point should not be rounded nearer than half a mile.

Leading island, just northward of Kyuquot channel, and nearly $3\frac{1}{2}$ miles from White Cliff head, is about $1\frac{1}{4}$ miles long in an east and west direction, half a mile wide, and rises near the centre to a hill 480 feet high, which, when kept midway between White Cliff head and Rugged point, N. by E. $\frac{3}{4}$ E., leads into the sound through the fairway of Kyuquot channel.

Blind entrance leads into Kyuquot sound westward of Union island, forming a narrow tortuous channel with some rocks in the outer part; it should not be entered by a stranger, though coasters often enter the sound by this channel, but no directions can be given for navigating it.

Narrowgut creek, in the south-east part of the sound, about $1\frac{1}{2}$ miles from the termination of the Kyuquot channel, is $1\frac{1}{4}$ miles long in an E. by N. direction, but is less than one cable wide just inside the entrance. The depths in it vary from 16 to 8 fathoms, and there is only just room for a small vessel to moor; the shores are high, and the creek easy of access to a steam-vessel. A stream of considerable size runs into the head of the creek, from which a bar extends 3 cables.

Shingle point, at the entrance to the creek on the north side, is bordered by a sandy beach, and has 9 fathoms close-to.

Deep inlet, at $1\frac{1}{4}$ miles north from Narrowgut creek, is about 3 miles long in an E.N.E. direction, but affords no anchorage on its north side, at the entrance, is a remarkable high precipice.

Ho hoae island, nearly in the centre of the sound, half a mile north of Union island, is about 2 miles long in a north-easterly direction, upwards of one mile wide, and about 600 feet high; its shores are rocky. On its north-east side is Dixie cove, where a small craft may anchor in 6 fathoms completely land-locked.

Pinnacle channel, between Ho hoae island and the east shore of the sound, is about 3 miles long in a northerly direction, and half a mile wide.

TAHSISH ARM, in the northern part of the sound, has its entrance 5 miles from the termination of Kyuquot channel. It is 6 miles long in a winding direction to the northward, and its shores, except at the head, are high and rugged; the head terminates in low swampy land, through which flows a considerable stream, off which a bank dries one cable; and there is a small village at the mouth of the stream; on the east side, 2 miles below the head, is a similar stream, off which a bank extends about 2 cables.

Fair harbour, on the east side of Tahsish arm, is $2\frac{1}{2}$ miles in length in a N.E. by E. direction, from 3 to 4 cables wide, and affords anchorage near either end in from 13 to 11 fathoms; its shores, generally, are high, and steep; at its head a bank dries off for one cable. The western end of the harbour is formed by a low, narrow neck about one cable wide at low water, connecting an island to the mainland of Vancouver, and separating the harbour from Pinnacle channel.

The entrance lies on the north side of this island, is nearly one mile long, and from one to 2 cables wide, with some small islets on its north side, the depths in it being very irregular, varying from 5 to 20 fathoms; when entering keep the south shore pretty close aboard, but take care to avoid a rock which lies on that shore about half-way in. A patch of 9 feet lies abreast it, and therefore considerable caution must be observed. This harbour can be entered by steam-vessels, or sailing-vessels with a fair wind.

Some rocks, the outer one of which covers, lie 3 cables westward from the entrance to Fair harbour, about one cable distant from the shore.

Moketas island, in the north part of the sound, between the entrance to the Tahsish and Kokshittle arms, is about 2 miles long, and one mile wide, rocky, about 400 feet high, its east and west sides

being steep-to. At one cable from its north shore, near the centre, is a sunken rock, and on its south-east side lie Channel rocks, a small patch about 3 feet above high water ; they, however, are steep-to.

The passage between Moketas island and the north shore of the sound is 3 cables wide in the narrowest part, with from 14 to 38 fathoms in mid-channel ; if using it, keep well over to the north side.

Kokshittle arm. the entrance of which is in the north-west part of the sound, about 6 miles from Kyuquot channel, is upwards of 8 miles long in a north-westerly direction, and about one mile wide at the entrance, narrowing gradually towards the head ; its shores are rocky, and of a broken outline, with several small islets off them. The depths in it vary from 20 to 80 fathoms, shoaling gradually towards the head. A very good anchorage, the best in the sound, is on its west side at 4 miles from the entrance. The head of the arm terminates in low swampy land, through which flows a small stream, and a bank extends off about 2 cables.

Just within the entrance, on the east side, is a small cove with 4 fathoms in the centre, available for small craft.

Easy creek, the anchorage before referred to on the west side of Kokshittle arm, and 13 miles from the entrance of the sound, is about 2 miles long in an E.S.E. direction, turning sharply round from its entrance and running in this direction parallel to the inlet, being separated from it by a narrow rocky peninsula. It is 4 cables wide at the entrance, narrowing gradually to the head ; the depths in it vary from 12 to 20 fathoms, and there is good anchorage from half a mile within the entrance to the head. The shores are rocky, of moderate height, steep-to on the north side, but from the south a sand-bank dries off in some parts nearly one cable. The best anchorage is one mile within the entrance, in from 13 to 16 fathoms, about one or 2 cables from the north shore ; when entering keep near the north shore.

On the opposite side of the arm, abreast Easy creek, is a village and a stream of considerable size, off which a bank dries out about 2 cables.

Chamiss bay, on the west side of Kyuquot sound, about one mile from the north part of Blind entrance, is nearly half a mile in extent, but affords no anchorage, the water being too deep.

Directions.—No sailing-vessel should attempt to enter Kyuquot sound, unless with a steady fair, or leading wind, as generally a heavy swell prevails outside, which in a light wind would render the position critical; and no stranger should attempt to venture in, unless the weather is clear, and the leading mark for the channel can be easily made out.

Entering the sound by the Kyuquot channel, which is the only one a stranger should use, keep a good offing, till the entrance of the channel is made out, (White cliff head, and Kyuquot hill at the south-east point of Union island, which have been before described, are very conspicuous, and will identify the channel,) when bring the summit of Leading island midway between Chatchannel and Rugged points bearing N. by E. $\frac{1}{2}$ E., and steer up the channel with that mark on; when nearing Chatchannel point, give it a berth of at least 4 cables to avoid the rock which lies off it. If bound to Narrowgut creek pass eastward of Leading island, and keeping about one cable from the south shore, enter the creek in mid-channel, and moor when inside.

If bound to Fair harbour, keep as before directed till near Leading island; pass to the westward of this island, and proceed up to the northward through Pinnacle channel, keeping about one cable or so from either shore, on to the entrance of Tahsish arm. On nearing Fair harbour keep from 2 to 3 cables from the east side of the arm till the entrance bears E.S.E., when steer for it on that bearing, keeping close over to the south shore (*see* page 363) till inside, and anchor in the middle, about half a mile from the east end, in 11 fathoms.

Bound to Easy creek, pass westward of Leading, Ho hoae and Moketas islands; enter the Kokshittle arm in mid channel, and proceeding up it for a distance of 4 miles will bring a vessel abreast the creek, which may be entered in mid-channel; anchor in from 13 to 16 fathoms, about one mile within the entrance, and from one to 2 cables from the shore.

Tides.—It is high water at full and change in Kyuquot sound at noon; springs rise 12 feet.

CLAN NINICK HARBOUR, on the Vancouver shore, 3 miles westward of Kyuquot sound, is about one mile long in a westerly direction, half a mile wide, and affords good anchorage, in from 7 to

10 fathoms, at half a mile from the head, from which a sand-bank extends 2 cables; its shores are mostly low, and there are some rocks on either side of the entrance.

The harbour is protected by Village, Table, and other islands of the Barrier group, and there is only one channel, the Halibut, into it through them, which should not, except under unavoidable circumstances, be attempted by a stranger.

Halibut channel, through the Barrier group to Clan ninick harbour, lies westward of Table and Village islands, and east of Look-out island. It is about 3 miles long in a northerly direction, and half a mile wide in the narrowest part; the depths in it vary from 16 to 6 fathoms, being somewhat irregular.

Table island, on the east side of the channel, is the largest of the Barrier group, being nearly half a mile in extent, and about 150 feet high to the tops of the trees; some rocks, mostly above water, extend half a mile from its south side, the outer one being 50 feet high, with 15 fathoms 2 cables west of it. Trap bluff on the west side of the island is conspicuous.

Half a mile E.N.E. of Table island is an anchorage with from 4 to 6 fathoms, tolerably sheltered from seaward by some islands, and much used by coasters in summer months; the entrance to it is rather intricate, and no stranger, or any except a small vessel, should attempt to enter.

Village island (locally known as Kyuquot), on the east side of Halibut channel, just north of Table island, is small, and about 150 feet high to the tops of the trees; on its east side is Aktese, a large native village, much frequented in summer; off it a bank dries nearly 3 cables. Eastward of this island among the Barrier islands is a small cove (Barter cove), with from one to $4\frac{1}{2}$ fathoms; it is well sheltered in all weathers, and much frequented by coasters when fur trading; the entrance to it is very narrow, being obstructed by a rock that dries 6 feet, but leaves a clear channel of 4 fathoms.

Two cables north of Village island is a rock awash at high water springs, but there is a depth of 5 to 6 fathoms at one cable from the west side.

Look-out island, at the south entrance of Halibut channel, lies nearly one mile south-west of Table island; it is small, has a few

trees, and about 150 feet high ; its east side may be approached to 2 cables, but half a mile off it are some rocks, on which the sea always breaks.

Granite island, which forms the south side of Clan ninick harbour, is about half a mile in extent, and joined by a sandy beach at low water to the Vancouver shore. Chief rock, 3 cables east from its east point, is a very dangerous rock, which lies at the termination of Halibut channel, and only uncovers at low-water springs.

Louise, a sunken rock, with less than 6 feet over it, lies with Channel rock bearing E.S.E., distant $6\frac{1}{10}$ cables.

Directions.—Bound into Clan ninick harbour by Halibut channel (which is the only passage by which a stranger can enter it), keep about 2 miles off the Barrier islands till Look-out island bears N.W. by N., when steer for the entrance of the channel, passing about 2 cables east of Look-out island. When the north-west end of Table island bears N.E., steer about N.N.E., or more easterly, so as to pass 2 or 3 cables north-west of Trap bluff ; on nearing Granite island, bring Trap bluff in line with the east high water part of Look-out island S.S.W. $\frac{1}{2}$ W., and steer N.N.E. $\frac{1}{2}$ E. for the entrance of the harbour, with the above-mentioned mark on astern, till the north side of Granite island bears W. by N. $\frac{1}{4}$ N., or the harbour comes well open, when a vessel will be clear of the Chief rock, and may haul in to the north-westward for the anchorage, passing about one cable southward of a small rock 4 feet above water lying on the north side of the harbour $1\frac{1}{2}$ cables within the entrance ; there is a clear passage northward of the last mentioned rock, about one cable wide.

As before noticed, no stranger should attempt to enter this harbour without a pilot, unless from absolute necessity, and if in a sailing-vessel, only with a steady fair wind.

Anchor in from 7 to 10 fathoms, with the extremes of the harbour bearing East and S.E. by S.

* **OU OU KINSH INLET**, 10 miles W.N.W. from Kyuquot sound, is 7 miles long in a north-easterly direction, and 8 cables wide at the entrance, narrowing gradually towards the head ; the shores within are high, rising from 2,000 to upwards of 3,000 feet.*

The depths in the inlet vary from 40 to 60 fathoms, and there is only one indifferent anchorage, Battle bay, just within the entrance

* See Admiralty plan :—Ou ou kinsh inlet, No. 716 ; scale, $m = 1\cdot8$ inches.

on the west side. The entrance lies west of the Barrier islands, and the depths in it vary from 40 to 48 fathoms.

Fairway rock, awash at low water, is situated in the approach to Ou ou kinsh inlet, with Clara islet N.E. $\frac{1}{2}$ E., distant one mile.

Clara islet, at the south-east extreme of the entrance, is small, bare, and 20 feet above high water; no vessel should go eastward of, or approach it within half a mile. This island is the westernmost of the Barrier islands, and lies $21\frac{1}{2}$ miles W. by N. from Tat chu point, where they may be said to commence.

Bunsby islands, on the east side of the entrance, close in shore, are about 2 miles in extent, and from 250 to 300 feet high; the passages between them and the shore are choked up with rocks, but their west side is steep-to; Pinnacle point and Green head at their south-west extreme are remarkable. North-eastward of these islands is Malksope inlet, 4 miles long in a north-easterly direction, but the entrance is intricate, and there is no anchorage within it.

Cuttle group, lying at the south-west entrance point of Ou ou kinsh inlet, and $1\frac{1}{2}$ miles N.N.W. from Clara islet, comprises a number of small islets and rocks, some of the former being wooded; nearly one mile S.W. from them is a rock on which the sea breaks in fine weather. On the Vancouver shore, just north-west of them, is Low cone, a remarkable summit 356 feet high, and useful in identifying the entrance.

Do not go to the westward of these islets, or approach their east side nearer than 2 cables.

Sullivan reefs are a very dangerous patch of rocks lying nearly 3 miles outside the entrance of Ou ou kinsh inlet, $2\frac{1}{2}$ miles W. by S. from Clara islet, and nearly 4 miles S.S.E. from Hat island in Nasparti inlet; they are about half a mile in extent east and west, and the sea only breaks occasionally on them; there are from 10 to 11 fathoms close around them.

Solander island, off cape Cook, just open east of the cape bearing W. $\frac{1}{4}$ S. leads $1\frac{1}{2}$ miles south; Hat island, in the entrance of Nasparti inlet, in line with a summit on the west shore of the inlet bearing North leads $1\frac{1}{4}$ miles west.

Battle bay, just within the entrance of Ou ou kinsh inlet, on the west side, is upwards of a mile wide, and half a mile deep, with several islets and sunken rocks inside it near the middle; near the north part there is anchorage in from 6 to 9 fathoms, which may be used in fine weather.

A rock, with a depth of 9 feet on it, lies with the summit of the southern Skirmish islet bearing N.E. $\frac{1}{4}$ E., distant $2\frac{1}{4}$ cables, and a rock, with a depth of 6 feet on it at low water, lies half a cable E. by N. $\frac{1}{2}$ N. from the north-east point of the islet on the south-west shore of Battle bay.

Directions.—If intending to enter Ou ou kinsh inlet, and anchor in Battle bay, keep an offing of 4 or 5 miles from the main, till Clara islet at the west extreme of the Barrier islands is made out, when steer for it on a N.E. bearing, passing about half a mile west of the islet, being careful to avoid Fairway rock awash at low water situated one mile S.W. of Clara islet. When abreast the islet steer for the centre of the entrance about N.N.E., round the Skirmish islets, which lie in the middle of Battle bay, distant 2 cables, and anchor in 7 fathoms, midway between them and the north side of the bay.

It is not recommended to use this anchorage, unless embayed, as it affords but indifferent shelter in southerly gales, and no sailing-vessel should attempt to enter unless with a steady fair wind.

Tides.—It is high water, full and change, in Ou ou kinsh inlet at noon; springs rise 12 feet.

NASPARTI INLET, $3\frac{1}{2}$ miles west of Ou ou kinsh inlet, on the east side of a large peninsula of which cape Cook is the south-west extreme, and in the head of an open bight or bay, is about 4 miles long, in a northerly direction, and about half a mile wide at the entrance, decreasing in some places to less than 3 cables. Its shores are high and rocky, indented by some slight bays; there is a fresh-water stream at the head, from which a bank extends about 3 cables. The depths vary from 13 to 30 fathoms, and there is a secure though rather limited anchorage, in from 13 to 16 fathoms, at half a mile from the head. Outside the entrance are several dangers.*

Haystacks, off the east side of the entrance, and $1\frac{1}{2}$ miles north from Sullivan reefs, are two bare, sharp-topped, clifly rocks, 65 feet high, and about 2 cables apart; at 2 cables from their west side are from 25 to 26 fathoms; northward of them, rocks and foul ground exist.

East rock, 3 cables from the east entrance point, is of small extent, has 17 fathoms at one cable westward of it, and covers at

* See Admiralty plan:—Nasparti inlet, No. 716; scale, $m = 1\cdot8$ inches.
SO 11948

half flood ; the Haystacks, open south of Yule islet, bearing S.E. by E., lead from 2 to 3 cables west of it.

Yule islet, about 40 feet high, lies midway between the Haystacks and East rock.

Mile rock breaker lies $1\frac{3}{4}$ miles from the west shore of the entrance to the inlet, and 2 miles W. by N. $\frac{1}{2}$ N. from Sullivan reefs. It is very dangerous, as it is of small extent, and the sea breaks on it with any swell ; the depths around it are irregular.

Hat island, in the entrance of inlet, in line with a summit on the west side bearing North, leads 3 cables east of it, and well clear of the Sullivan reefs, into the inlet. Do not stand westward of this danger.

Mile rock, nearly one mile north of the above-mentioned danger, is a small bare rock, 12 feet above high water ; there are 29 fathoms one cable east of it. A ledge extends fully one cable from its north side.

Hat island, 70 feet high, lying in the centre of the inlet just within the entrance, is small, and has a few stunted trees on the summit ; from the southward it is very conspicuous, and appears somewhat like a hat. It is steep-to on the east side, but nearly midway between it and the west shore is a shoal patch of $2\frac{1}{2}$ fathoms, marked by kelp ; also two rocks marked by kelp lie in the fairway S.E. of Hat island. The inner rock lies about one cable from the island ; the outer rock with 3 fathoms over it lies $2\frac{1}{4}$ cables S.S.E. $\frac{1}{2}$ E. from the east extreme of the island.

Directions.—Nasparti inlet should not be used by a stranger unless from necessity, as in thick or cloudy weather it might be difficult to make out the leading marks, and no one should attempt to enter unless they are well made out, especially as the sea only breaks on the outlying dangers in heavy weather, and they are seldom seen. A sailing-vessel should, in passing the entrance of this and Onoukin inlet, keep Solander island open south of the land east of cape Cook bearing West.

If entering Nasparti inlet, keep Solander island (off cape Cook) in line with the land eastward of it bearing W. $\frac{1}{4}$ S., until Hat island

comes in line with a summit on the west side of the inlet bearing North, when steer in for the entrance on that bearing, which will lead 3 cables east of the Mile rock breaker, well clear of the Sullivan reefs, and half a mile west of East rock; pass east of Hat island and the shoals lying S.E. of it, and steer up the inlet in mid-channel, anchoring in 13 fathoms, about one-third of a mile from the head.

Tides.—It is high water at full and change in Nasparti inlet at noon; springs rise 12 feet.

BROOKS PENINSULA.—Westward of Nasparti inlet is a peninsula, 9 miles long, and about 5 miles wide, projecting S.S.W.; its shores are for the most part very rocky, and rise almost abruptly from the sea to upwards of 2,000 feet; there are several off-lying dangers around it, some of which extend upwards of one mile from the shore.*

Cape Cook or Woody point, the south-west extreme of this peninsula and the most projecting point of the outer coast of Vancouver island, is 163 miles W. by N. $\frac{1}{2}$ N. from the lighthouse on Tatoosh island. The cape rises abruptly from the sea 1,200 feet.

At 2 miles from cape Cook and the south side of the peninsula the depths are from 20 to 90 fathoms, and as a rule no vessel should approach nearer.

Cape Cook is situated in latitude $50^{\circ} 7' 0''$ N., longitude $127^{\circ} 55' 30''$ W.

Banks reef, which covers at three-quarters flood, and on which the sea breaks heavily, lies 3 miles E.S.E. from cape Cook, and two-thirds of a mile from the shore.

Solander island, nearly one mile west of cape Cook, is bare, 580 feet high, and has two sharp peaks; between it and the cape the passage is choked up with rocks, and no vessel or even boat should go inside the island.

BROOKS BAY, on the west side of Brooks peninsula, is a large open bay about 12 miles wide, and 6 miles deep; there are several dangers within it, and two inlets, Klaskish and Klaskino, which afford anchorage but are very difficult of access, and no sailing-vessel should attempt to enter either unless embayed and unable to get out of Brooks bay: the soundings are irregular, varying from 17 to 48 fathoms, shoaling generally to the northward.†

* See Admiralty chart:—Quatsino to Esperanza, No. 583; scale, $m = 0.5$ inch.

† See Admiralty plan:—Klaskino and Klaskish inlets, No. 590; scale, $m = 2$ inches.

Clerke reefs lie in the south-east part of the bay, 5 miles north from cape Cook, their outer extreme being $2\frac{1}{2}$ miles off the east shore of the bay. They cover an extent of upwards of 2 miles, some are under water, others uncover, and no vessel should venture among them.

Cape Cook, bearing S.S.E. $\frac{1}{2}$ E., leads 2 miles west of these reefs; and Small islet at the entrance of Klaskish inlet, in line with Leading cone at its head, bearing N.E. by E. $\frac{1}{3}$ E., leads $1\frac{1}{2}$ miles north.

KLASKISH INLET, at the head of Brooks bay on the west side of Brooks peninsula, and 10 miles N.N.E. from cape Cook, is about 3 miles long in a north-easterly direction, and one mile wide at the entrance; at its head is a long narrow basin, the entrance of which is too contracted for a vessel to enter. There is an anchorage just within the entrance to the inlet on the south side, to the eastward of Shelter island, but it is difficult of access to a sailing-vessel.*

Caution.—The entrance to this anchorage is intricate and narrow; and, unless unavoidably necessary, no vessel larger than a coaster should attempt it, as a furious sea rages all around the outer parts.

Ship rock, lying $7\frac{1}{2}$ miles N. by W. from cape Cook, 2 miles distant from the shore in the centre of Brooks bay, and midway between Klaskish and Klaskino inlets, is of small extent, and has from 17 to 20 fathoms close on its south and east sides; the sea generally breaks very heavily over it.

Surge islets, on the south side of the entrance, $5\frac{1}{2}$ cables from the shore, are small, rocky, and about 40 feet high; foul ground exists among them, and when entering the inlet do not approach their west side nearer than 5 cables.

Shelter island, just within the entrance of the inlet on its south side, is about half a mile in extent, 300 feet high, with a hill at each end with a few stunted trees; some rocks extend a short distance from its east and west sides, but the north shore is steep-to. The anchorage on its east side is about one third of a mile in extent, with from 10 to 13 fathoms, well sheltered, but the bottom is irregular; the entrance to it, round the north east side of the island, is less than one cable wide in the narrowest part. About one cable from the north-east point of Shelter is Bare islet, 15 feet high, which on entering the anchorage should be passed close to on its east side.

*See Admiralty plan :—Klaskish inlet, No. 590; scale, $m = 2.0$ inches.

Between Shelter island and the north entrance point of the inlet is a heavy confused sea, which is dangerous for sailing-vessels, as the wind generally fails there.

Directions.—Entering Klaskish inlet when coming from the eastward, and intending to anchor on the east side of Shelter island, do not bring cape Cook southward of S.S.E. $\frac{1}{2}$ E., till Leading cone, a remarkable hill at the head of the inlet about 500 feet high, comes in line with Small islet on the north side of entrance bearing N.E. by E. $\frac{1}{2}$ E., which mark will lead into the inlet well north of the Clerke reefs and Surge islets; when abreast the latter, haul a little to the eastward, so as to enter midway between Small islet and Shelter island; pass within one cable east of Bare islet off the latter's north-east point, and anchor in 13 fathoms with the extremes of Shelter bearing N.W. by W. $\frac{1}{2}$ W. and S.W. $\frac{1}{2}$ W.

Tides.—It is high water, full and change, in Klaskish inlet at noon; springs rise 12 feet.

KLASKINO INLET, the entrance to which is in the north part of Brooks bay, 10 miles N. $\frac{3}{4}$ W. from cape Cook, is nearly 6 miles long in a winding direction E.N.E. Numerous rocks lie off the entrance, but there is an intricate passage through them; and there is also a good anchorage on the south side, 2 miles within the inlet. The depths vary from 10 to 20 fathoms in the lower part of the inlet, increasing gradually towards the head to 40 fathoms; the inlet here becomes narrow, with high and rocky shores, terminating in low land at the head.*

Caution.—The entrance of Klaskino inlet is even more intricate than Klaskish, and should not be attempted by a stranger unless absolutely for safety.

Nob point, the south entrance point of the inlet, is rocky, and covered with a few stunted trees, and close to its outer part is a rocky nob about 100 feet high. From Nob point a line of reefs above and below water with deep water between them extend fully $1\frac{1}{2}$ miles in a W.N.W. direction.

Twenty-foot rock, 4 cables N.W. by W. from Nob point, is bare and 20 feet above high water. It is conspicuous from the outside, and there are 19 fathoms close to its north and west sides, but between

*See Admiralty plan of Klaskino inlet, No. 590; scale, $m = 2\cdot0$ inches.

it and Nob point the passage is choked up with rocks; the only channel into the inlet being westward of the rock, between it and Channel reefs.

Two rocks on which the sea breaks at low water lie southward of Channel reefs, and one mile distant from Nob point. The southernmost lies three-quarters of a mile S.W. $\frac{1}{4}$ W. from Twenty-foot rock.

Channel reefs, the south-east part of which is $3\frac{1}{2}$ cables W. by S. from Twenty-foot rock, are a cluster of rocks, mostly under water, extending in a westerly direction to the north-west shore of Brooks bay. There is deep water between them in many places, but the only safe passage into Klaskino inlet upwards of 3 cables wide with deep water is between their south-east part and Twenty-foot rock.

Anchorage island, in the middle of the inlet, about 2 miles within the entrance, is of small extent and rocky; some small islets extend one cable from its north-west and south-east points. The anchorage between the east side of this island and the shore is from 3 to 4 cables in extent, and well sheltered, with from 9 to 10 fathoms water; the entrance to it, round the south-east point of Anchorage island, is about one cable wide in the narrowest part, with from 13 to 17 fathoms in the middle.

Between Twenty-foot rock and the entrance to the anchorage are several dangers; a rock 3 feet high lies $8\frac{1}{2}$ cables S.W. $\frac{3}{4}$ W. from the south-east point of Anchorage island, and another 2 feet high 3 cables S.W. $\frac{3}{4}$ S. from the same point, and there is a reef which covers one cable W. by S. $\frac{1}{2}$ S. from the latter rock. When entering the inlet pass northward of these.

Above Anchorage island some rocks extend nearly across the inlet, rendering it almost impossible for a vessel to go beyond them.

Red Stripe mountain, rising on the north side of entrance, abreast Anchorage island, is of a remarkable conical shape, 2,200 feet high, with a valley on either side of it; on its south part, facing seaward, is a conspicuous red cliffy stripe or landslip, easily distinguished from the outside.

Directions.—Bound for Klaskino inlet, when outside Ship rock, bring Twenty-foot rock in line with the lower part of the red stripe on Red Stripe mountain bearing N.N.E. $\frac{3}{4}$ E., and run boldly for the

entrance with that mark on, which will lead $2\frac{1}{2}$ cables east of the southern patches of the Channel reefs; keep on this course till within 2 cables of Twenty-feet rock, when haul a little to the northward, and pass it on its north side at one cable distant, after which steer about N.E. by E. $\frac{1}{2}$ E. for the centre or south part of Anchorage island, passing one cable or so north of the rocks off the south side of the inlet; when abreast the south-west point of the island, haul quickly to the eastward, round the rocks off its south-east point within half a cable, and anchor in from 9 to 10 fathoms midway between the east side of the island and the main, with extremes of the former bearing N.W. and S.W. by W.: a large vessel should moor.

Three miles from Klaskino, in the extreme north part of Brooks bay, is a large rivulet where boats may enter and find shelter in bad weather.

Tides.—It is high water, full and change, in Klaskino inlet at noon; springs rise 12 feet.

Lawn point, the north-west extreme of Brooks bay, lies 12 miles N.W. by N. from cape Cook; it is low, and some rocks extend more than half a mile in an easterly direction from it, inside of which a boat may find shelter: the sea breaks violently about this point, and everywhere along the shores of Brooks bay. A vessel should keep a good offing.

The land in the vicinity of Lawn point appears very fertile, and lightly timbered; it rises gradually from the sea to a height of 1,900 feet.

Boat shelter.—Between the entrance to Klaskino inlet and Lawn point is a deep bay, in which are several islets and reefs; it is unfit for anchorage, being open to seaward, but at its head, north of May-day island, there is good shelter for boats.

QUATSINO SOUND, the north-westernmost of the deep inlets on the outer coast of Vancouver island, penetrates the island in a north-easterly direction for upwards of 25 miles. At the entrance between Reef point (on the south) and Entrance island, it is nearly 6 miles wide, narrowing to less than one mile at 5 miles within; the sound then takes a north-easterly direction, nearly straight for 13 miles, when it branches off in two arms, one (South-east arm) extending to the south-east for 12 miles, and terminating in low land. The other

(West arm) lies to the northward, and is connected with the sound by a straight narrow pass about 2 miles long ; it is 22 miles long in an east and west direction.*

Just within the entrance of the sound on the north side is Forward inlet, a much smaller arm, about 6 miles long in a northerly direction, in which are the best anchorages in the sound.

The shores of Quatsino sound are mostly high, and near the entrance very much broken ; there are several small islands within and along its shores.

From the outside the entrance to Quatsino sound presents several remarkable features, which render it easy to be made out ; along its eastern side are several rocks and small islands ; and on both sides of and within the sound the land is high, some of the mountains being very conspicuous. Among these are the Flattop and Entrance mountains northward of the entrance, and Nose peak and Gap mountains inside : Nose peak being easily distinguished by its sharp rocky summit, 1,730 feet high.

There are several dangers along the western side of the entrance ; in the fairway are two very dangerous rocks, on which the sea only breaks in heavy weather, and it requires great caution on the part of the navigator to avoid them, when entering or leaving the sound.

Reef point (Omannys), the south-east entrance point of the sound, 14 miles N.W. by N. from cape Cook, and $1\frac{1}{2}$ miles from Lawn point, the north-west extreme of Brooks bay, is low and rocky, but rises gradually to a well-defined mountain, 1,901 feet above the sea : the coast between it and Lawn point forms a slight bay filled with a number of rocks extending a considerable distance from the shore.

Boat cove, into which flows a small stream (Culleet river) in which a boat can enter, and find shelter in bad weather, is a small bight on the east shore of the sound, $5\frac{1}{2}$ miles North from Reef point : the coast between the two places is indented by several bays, and fringed by reefs, which extend in many places nearly one mile from the shore, and over which the sea usually breaks very heavily.

Bold bluff, 7 miles north from Reef point, on the south side of the sound, is, as its name implies, a bold rocky salient bluff rising suddenly to upwards of 200 feet, when it slopes gradually to a

* See chart. No. 582.

* See Admiralty plan, Quatsino sound, No. 570 ; scale, $m = 2\cdot0$ inches.

summit 1,609 feet high. At this spot the sound contracts to less than one mile in breadth.

Surf islands, $1\frac{1}{2}$ miles S.S.W. from Bold bluff, and 3 miles within the entrance to Quatsino sound, are a chain of small islands nearly one mile long in a N.W. and S.E. direction, some of which have a few stunted trees, and are about 40 feet above high water; a short distance from them are a number of rocks on which the sea breaks. Although there appears to be deep water between these islands and the east side of the sound, it is not advisable to use that passage, as it has not been sufficiently examined.

Entrance island, $5\frac{1}{2}$ miles N.W. $\frac{1}{2}$ N. from Reef point, at the north-west entrance point of the sound, is small and rocky, about 140 feet high, and covered with a few stunted trees. Northward of it is a narrow boat pass into the sound, about one cable wide, but filled with rocks, passable only in fine weather.

Danger rocks, on the western side of the entrance, nearly in the fairway, are two very dangerous pinnacle rocks, of small extent, half a mile distant from each other in a N.W. and S.E. direction, and steep-to on all sides. South Danger rock is awash at low water, and lies one mile East from the south extreme of Entrance island; North Danger rock (Okookstaw) is 7 cables distant from the same island, and breaks at low water; there is deep water between the rocks. The sea very seldom breaks on these rocks, great caution is therefore required to avoid them, when entering or leaving the sound.

Pinnacle islet, in line with the east point of Low islets, in Forward inlet, bearing N.N.W. $\frac{3}{4}$ W., leads nearly 4 cables west of Danger rocks, and midway between the North rock and Entrance island.

Robson island, in Forward inlet, open north of Entrance Mount point bearing N.W. by W. $\frac{1}{2}$ W., leads 3 to 4 cables east of Danger rocks; and Village islet, on the east side of Forward inlet, just touching Brown point bearing N.W., leads about three-quarters of a mile east of them, and midway between them and the Surf islands.

Bold bluff, in line with the gap in the centre of Surf islands, bearing N. by E. $\frac{1}{2}$ E., leads nearly 8 cables S.E. of South Danger. Between the Danger rocks and Surf islands, the passage is $1\frac{1}{2}$ miles wide.

FORWARD INLET, on the west side of the sound, is one mile wide at the entrance, and about 6 miles long; it first takes a north-westerly direction for 2 miles from its outer part, then turning N.N.E. for 4 miles, it contracts in breadth, and becomes shoal at the head, terminating in large salt-water lagoons; in the upper part it contracts to less than a quarter of a mile in width in some places; there are two anchorages within it, North and Winter harbours, the former easy of access to sailing-vessels, and both are very secure and well sheltered.

Entrance and Flattop mountains, on the west side of Forward inlet near the entrance, are very conspicuous objects from seaward; the former is 1,275, and the latter 960 feet high.

Pinnacle islet, three-quarters of a mile north of Entrance island, is a small jagged rock about 40 feet high, with a few trees on its summit.

Robson island, in the bend of Forward inlet on the west side, $1\frac{1}{2}$ miles from Pinnacle islet, is about half a mile in extent, and 385 feet high, and its shores are rocky. Between it and the west shore is a narrow passage of 2 to 5 fathoms water. Low islets, 4 cables S.E. from Robson island, are small wooded islands which are steep-to on all sides.

Village islet.—A small village is situated on the east side of Forward inlet abreast Robson island, and close off it is Village islet, a small bare islet about 40 feet high, which is rather conspicuous.

Bare islet, lying off the north-east entrance point to Forward inlet, is about 12 feet high, and steep-to on the outside; it is $1\frac{1}{2}$ cables from the shore, but the passage inside is only fit for a boat.

Burnt hill, 1,095 feet high, just over Brown point, the north-east entrance point of Forward inlet, is remarkable from the southward, being bare of trees and cliffy on its south side.

NORTH HARBOUR, which lies north-west of Robson island, on the west side of Forward inlet, is a snug and secure anchorage, about 4 cables in extent, with from 4 to 6 fathoms. The entrance is 3 cables wide, rendering the harbour easy of access to sailing-vessels; it is perhaps the best anchorage within the sound, and from being only 4 miles within the entrance is very convenient.

Browning creek, in its west part, extends $1\frac{1}{4}$ miles westward, and is very narrow, with from 2 to 5 fathoms in it, terminating in a shallow basin, dry at low water.

Observatory rock, which lies on the north side of the entrance to North harbour, is a small bare rock, connected at low water to the mainland.

WINTER HARBOUR comprises that part of Forward inlet which runs in a N.N.E. direction, and is a capacious anchorage with from 8 to 11 fathoms. Its shores are low and bordered by a sandy beach, and the harbour becomes shoal at a distance of one mile from the head; its breadth varies from 2 to 6 cables. There is a store here where provisions and clothes may be obtained.

Log point, just outside the entrance to this harbour on the east side, is low, and bordered by a sandy beach; southward of it, and extending 4 cables from the shore, is New bank, with $3\frac{1}{2}$ fathoms on the shoalest part, and contracting the breadth of the entrance passage to the harbour to less than one cable between it and a shoal spit extending from the opposite shore; but, by keeping a little over to the west side when abreast North harbour, this bank may be avoided, and enter Winter harbour without danger.

At the narrowest part of the entrance to Winter harbour, above Log point, on the west side, is Grass point, bordered by a sandy beach, which is steep-to.

Pilley shoal, of 3 fathoms, on the north side of Quatsino sound, is of small extent, steep-to on the outside, and marked by kelp. It lies $1\frac{1}{2}$ cables from the shore, and one mile west from Bold bluff

Boat cove, on the north side of the sound, is of small extent, with 5 fathoms inside; it would afford good shelter for a small craft; the north shore of Quatsino sound between it and Bare islet is rocky and very much broken.

Bedwell islets, lying $5\frac{1}{2}$ miles within the entrance, off a projecting point on the north side of the sound, are of small extent, wooded, and separated from the shore by a very narrow boat pass, which is conspicuous from the entrance. Monday shoal, at 3 cables

N.E. of them, has 4 fathoms (and reported less water) on it, is marked by kelp, and steep-to on the outside; eastward of Bedwell islets no swell is ever experienced in the sound.

Tides.—It is high water, full and change, in Quatsino sound at 11 hours; springs rise about 11 feet.

KOPRINO HARBOUR, 8 miles within the entrance, in the centre of a bay on the north shore of Quatsino sound, is a perfectly landlocked but small anchorage affording room for one or two ships to lie moored within. It lies northward of Plumper island, which is about half a mile in extent, low, wooded, and steep-to on all sides, there being a good passage on either side of it into the harbour. There is a store here where provisions and clothing may be obtained.*

Dockyard island, in the west part of the harbour, midway between Plumper island and the north shore, is small, and a ledge, the greatest depth on which is 4 fathoms, connects it with Plumper island.

Mud bank, about $1\frac{1}{2}$ cables N.E. from Dockyard island, in the middle of the harbour, is a small patch of 15 feet; there is good anchorage one cable south of Dockyard island, in 14 fathoms.

Wedge island lies at the eastern limit of the anchorage, about one cable north of Plumper island; it is very small, and covered with a few bushes, a ledge extends a short distance westward from it; there is a deep passage on either side of it into the harbour.

Observatory islet, at the north-east extreme of the harbour, is bare and about 12 feet high; it is 2 cables north of Plumper island, and 3 cables from the north shore, connected to the latter by a bank which dries at low water. This islet is in lat. $50^{\circ} 30' 0''$ N., long. $127^{\circ} 52' 16''$ W.

East cove, the head of the bight between Observatory islet and Prideaux point, appears to afford good anchorage in 6 to 10 fathoms; but the entrance to it has not been sufficiently examined to recommend its being used by a large vessel.

Prideaux point, the east entrance point of East passage, is low, bordered by a sandy beach. The north shore of the sound from Prideaux point takes a general north-easterly direction for 9 miles to Coffin islet, at the entrance of Hecate cove. It is bordered by a sandy

* See plan of Koprino harbour on Admiralty chart, No. 570; scale, $m = 6.0$ inches.

beach, and Percy ledge lies 6 miles from Prideaux point, is 2 cables from the shore, and has 4 fathoms on its outer edge.

From Bold bluff the south shore of the sound trends nearly parallel to the northern for 13 miles in a north-easterly direction. It is high and indented by two bays of considerable size, and some small creeks, none of which afford anchorage.

In Koskeemo bay, at 2 miles within Bold bluff, is a native village of considerable size (May hat tee) and anchorage in 17 fathoms. Village islands, at the east extreme of Koskeemo bay, are of small extent and low; their outer part is steep-to. Shoal water extends $2\frac{1}{2}$ cables north-west from the entrance of Maad river.

Brockton island (Quolaad), lying 2 cables from a projecting point on the south side of the sound, 7 miles N.E. from Bold bluff, is nearly half a mile long, but narrow; its west side is steep-to.

Limestone island (Maichagh), 15 miles within the entrance, and in the centre of the sound, is nearly 3 miles long, and about three-quarters of a mile wide in the broadest part. Its shores are rocky, and the island is of moderate height; Quiet cove, on its north-west side, is small, and affords anchorage for small craft.

Foul islets, lying midway between Holloway point, the south-west extreme of Limestone island, and the south shore of the sound, are small, and about 3 cables in extent in an east and west direction. There is a deep passage, about 2 cables wide, on either side of them: the south passage is to be preferred.

Single islet, half a mile north-eastward from Holloway point, and 3 cables north of the Foul islets, is low and bare.

Kultus cove, abreast Limestone island, on the south side of the sound, is about half a mile in extent, with irregular soundings of from 12 to 25 fathoms; it affords no anchorage, except for small craft.

South-east arm, the entrance to which is one mile east of Limestone island and 18 miles within the entrance of the sound, is 10 miles long in a south-easterly direction, and varies in breadth from 3 cables to one mile. Its shores are generally high and rugged, but terminate in low land at the head; the depths in it vary from 30 to 70 fathoms, and there is no anchorage, except for small craft; a bank dries off 2 cables from the head, and close to its edge is a depth of 15 fathoms.

Mist rock, 5 miles within the entrance, and 4 cables from the east shore, is of small extent, and covers at half flood ; by keeping well over to the west shore, a vessel will clear it.

Atkins cove, on the east side of the entrance to South-east arm, is 4 cables long in a northerly direction, and one cable wide, with from 5 to 7 fathoms ; there is room for a small vessel to anchor in it, but the cove is open to the south-east.

Whitestone point, at the separation of the two arms at the head of Quatsino sound, is a rocky point of moderate height, and lies three-quarters of a mile N.E. from Limestone island, and abreast Coffin islet. Bull rock, which covers, and is marked by kelp, lies 3 cables south from Whitestone point, and 2 cables from the shore. Between Atkins cove and Whitestone point the coast is rocky, and should not be approached nearer than 3 cables.

HECATE COVE (Kagaogh). on the north shore about one mile N.E. of Coffin islet, indents the shore about two-thirds of a mile in a north-westerly direction, is from 2 to 3 cables wide, and affords good anchorage near the centre in 9 to 11 fathoms. In the inner part of the cove, near the north side, are some shoal patches, marked by kelp, with only 11 feet water in some parts ; the shores of the cove are moderately high, and bordered by a sandy beach.*

This cove is convenient for steam-vessels or small craft ; anchor in about 11 fathoms, with the entrance points bearing South and S.E. ; a large vessel should moor. There is a depth of 18 feet at the end of the wharf.

There is a settlement of Norwegians on the west side of the cove. There is a store and post office here.

Kitten island, at the east side of entrance, is steep-to on the outside.

Round island (Quatishe), nearly in mid-channel, about 1 mile East of Hecate cove and just south of Quatsino narrows, is small, and of moderate height ; there is a clear passage between it and the north shore, but the one south of it is filled with rocks.

At 3 cables S.E. from it is Bight cove, of moderate extent, with from 8 to 10 fathoms inside, but as the tide runs strongly off the entrance and there are also some rocks, it is recommended for small craft only.

Quatsino narrows, 20 miles inside the sound and connecting it with Rupert and West arms, are 2 miles long in a northerly

See chart, No. 582.

* *See plan of Hecate cove on Admiralty chart, No. 570 ; scale, m = 6·0 inches.*

direction, and $1\frac{1}{2}$ cables wide in the narrowest part; the depths in it vary from 12 to 20 fathoms, its shores are high and rocky. Turn point, at the south-west extreme of the narrows, is bold and cliffy, the coast turning sharply round it to the northward; a short distance off it are some strong tide rips.

Philip and James points, at the north extreme of the narrows, are bold and steep-to; off the latter, which lies on the east side, is a small island named Maquazneecht.

Tidal streams.—The tidal streams run through these narrows at a rate of from 4 to 6 knots, and the streams turn shortly after high and low water.

RUPERT ARM, north east of Quatsino narrows, is 5 miles long in a north-easterly direction, and nearly one mile wide; its shores are high; its head terminates in low land, and a bank dries off it for 2 cables. The depths in this arm vary from 80 to 30 fathoms, shoaling gradually to the head, off which a vessel may anchor, in 14 to 17 fathoms, a short distance from the edge of the bank.

Marble creek, which lies half a mile East of the narrows, at the entrance of Rupert arm, is of small extent, and affords anchorage in from 5 to 6 fathoms; off its head a sand-bank extends 4 cables, and midway up the creek are some small islets on either side: if intending to anchor, pass between and go just inside them.

From Rupert arm to Hardy bay, on the north-east side of Vancouver island, is a distance of only 6 miles, and a trail exists between the two places, much frequented by the natives for trading purposes to fort Rupert.

Hankin point (Ruanispah), abreast Quatsino narrows on the north side, is bold and rocky; it separates the Rupert from the West arm.

WEST ARM trends in a westerly direction nearly 18 miles from the north part of Quatsino narrows, and varies in breadth from 2 cables to one mile. Its shores are mostly high and rocky; the northern shore is indented by several small bays, and off it are some rocks and small islands. There are two anchorages, one at Coal harbour on the north side, and the other at the edge of the bank extending from the head; the former is of moderate extent, and the best anchorage northward of the narrows.

West arm gradually decreases in breadth to the westward of the Stragglings islands; the head terminates in low land, and a bank extends upwards of 2 cables from it; close to the outer edge of the latter are from 12 to 14 fathoms, where a vessel may anchor.

Coal harbour, 2 miles from the narrows, on the north side of West arm, is of square shape, from 3 to 4 cables in extent, and affords good anchorage near the middle in from 12 to 14 fathoms. The shore is bordered by a sandy beach, and at the head are some fresh-water streams. This anchorage is easy of access; indications of coal have been met with in this vicinity. It was at one time worked, to a small extent.

Pot rocks, which lie 2 miles West from Coal harbour, and 3 cables from the north shore, are of small extent, and cover at three-quarters flood.

Stragglings islands, about 5 miles from the narrows, are a group of small islands and rocks extending upwards of half a mile from the north shore; the depths among them and to the northward are irregular; when passing them do not approach their south side nearer than 2 cables. Just west of them on the north shore is a small patch of swampy ground, through which flow some fresh-water streams, and a bank extends one cable from it.

Directions.—Entering Quatsino sound from the southward, give Reef point, its south-east entrance point, an offing of about 2 miles, and steer North till Bold bluff comes in line with the gap in the centre of the Surf islands, bearing N. by E. $\frac{3}{4}$ E. (*see* page 377), which mark kept on will lead south-east of Danger rocks; when the west side of Robson island comes open north of Entrance Mount point in Forward inlet, bearing N.W. by W. $\frac{1}{2}$ W., or Village islet on the east side of that inlet, is just touching Brown point, bearing N.W., a vessel will be well east of these rocks. If bound up the sound, round the north end of Surf islands, distant about half a mile, or if going to Forward inlet, steer about N.W. by W., taking care not to shut in the south side of Robson island with Entrance Mount point, until Bedwell islets come open north of Bold bluff bearing N.E., when she will be well north of Danger rocks. Pass from one to 2 cables off the east sides of Low islets and Robson island, and rounding the north point of the latter, at the same distance, enter North harbour, and anchor in from 4 to 6 fathoms near its centre.*

* *See* chart, No. 570.

If intending to anchor in Winter harbour, when abreast the north part of Robson island, steer N.N.W., keeping well over to the west shore to avoid New bank (*see* page 379), and when past it enter the harbour in mid-channel, anchoring in 11 fathoms about half a mile north of Grass point. Winter and North harbours are the best anchorages in the sound, and easily available for sailing-vessels, which could beat into the latter, and from being situated near the entrance their position is very advantageous.

Bound to Koprino harbour, which can only be entered by steam-vessels or sailing-vessels with a fair wind, round the north-west point of Surf islands at about half a mile distant, and steer up the sound in mid-channel until abreast the harbour. If in a large vessel, go through the East passage, keeping from one to 2 cables from Plumper island; enter the anchorage on either side of Wedge island, and moor immediately the vessel is west of it (with anchors north and south); a vessel may also enter by West passage, and anchor in 14 fathoms, southward of Dockyard island.

When navigating the sound eastward of Koprino harbour the chart (No. 582) is indispensable, but a mid-channel course should be kept; large sailing-vessels should not, however, go eastward of that harbour, as the anchorages beyond are rather difficult of access for them. If wishing to anchor in Hecate cove, enter it in mid-channel, passing north of Limestone island, and moor immediately inside the entrance points; the tidal streams run from one to 3 knots abreast the entrance, and should be guarded against.

Going through the Quatsino narrows, keep well over to the north shore, pass north of Round island, round Turn point close to, and guarding against tidal stream, steer up the narrows in mid-channel; these narrows should only be attempted at slack water or with a favourable tide, unless in a full-powered steam-vessel. The best anchorage north of the narrows is Coal harbour, and if wishing to go there, a north-west course for 2 miles from the narrows will lead to its entrance, and a vessel may anchor near the centre in from 12 to 14 fathoms. In navigating the West arm keep well over to the south shore, when in the vicinity of the Pot rock and Straggling islands.

From westward.—Entering Quatsino sound from the westward, keep an offing of about 2 miles, till Entrance island bears N.E. or N.E. by N., when steer to pass about 2 cables east of it, but not further off. When abreast it haul to the northward, bringing

See charts, Nos. 570, 582.

Pinnacle islet in line with the east side of Low islets, bearing N.N.W. $\frac{3}{4}$ W., and steer up with that mark on till Bedwell islets come well open north of Bold bluff, bearing N.E., when enter Forward inlet, or proceed further up the sound, as before directed.

If, when coming from the southward, Pinnacle and Low islets can be well made out, a vessel by keeping the former in line with the east part of the latter, bearing N.N.W. $\frac{3}{4}$ W., will pass 3 cables west of Danger rocks; but as a rule it would be more prudent to pass eastward of them.

If the weather be so thick that the marks for clearing Danger rocks cannot be distinguished, a seaman, if able to distinguish Entrance island, may enter the sound by steering for it on a N. by E. or north-easterly bearing; pass close to its east side, and haul to the northward when abreast it; by keeping half a mile on that course, the vessel will be well clear north-west of the Danger rocks, and may proceed anywhere up the sound. On a clear night in fine weather a vessel may also enter in the above manner.

There is room, with a steady breeze, for a smart working vessel to beat into the sound to the southward and eastward of Danger rocks though without previous knowledge of the place it would be rather hazardous to attempt it. If obliged to do so, when standing to the northward towards Danger rocks, tack when Bold bluff comes in line with the centre of the northernmost (wooded) Surf island, bearing N.N.E. $\frac{1}{2}$ E.; and, in standing to the east shore, tack when Bold bluff comes in line with the south-east extreme of the Surf islands bearing N. $\frac{3}{4}$ E. or N. by E. When the south side of Robson island comes open north of Entrance Mount point, N.W. by W. $\frac{1}{2}$ W., the vessel will be eastward of Danger rocks, and may stand further to the northward.

Beating between Surf islands and Danger rocks, tack at about 3 cables of the former; and when standing towards the latter keep Robson island open as before directed, till Bedwell islets comes open north of Bold bluff, N.E.; if going to North harbour, when inside Forward inlet, guard against New bank.

The COAST of Vancouver island from Quatsino sound to cape Scott, the north-west extreme of the island, takes a general W.N.W. direction; it is mostly rocky and iron-bound, indented by several bays, most of which are small, and from the projecting points some rocks extend in some places nearly one mile from the shore.

Caution.—When navigating between cape Scott and Quatsino sound do not approach the shore nearer than 2 miles.

Rugged point, 3 miles from Quatsino sound, is a rocky, rugged point, of moderate height, with 12 fathoms at half a mile outside it. Open bay, which lies just inside it, affords landing for boats in fine weather on its east side.

The coast between Open bay and the entrance to Quatsino sound is high and cliffy ; some rocks extend nearly one mile from it.

Top-knot point, 5 miles N.W. of Rugged point, is low, with a hill 300 feet high, shaped like a top-knot, just within it ; some rocks extend half a mile southward from it.

Raft cove, 8 miles from Rugged point, is an open bight about one mile in extent, and affords no shelter whatever.

Cape Palmerston, 11 miles N.W. from Rugged point, is a bold rocky point rising to 1,422 feet ; some rocks extend half a mile from it.

SAN JOSEF BAY, the entrance to which is 14 miles N.W. from Rugged point and 8 miles S.E. from cape Scott, is an extensive open bay, 3 miles deep in a north-easterly direction ; the breadth at the entrance is nearly 2 miles, narrowing gradually towards the head. Its shores are high, and off the south side are several off-lying rocks ; the depths vary from 11 to 4 fathoms, but the bay affords no shelter except with northerly winds, and should only be used as a stopping place in fine weather ; generally a heavy sea sets into it, and a sailing-vessel caught there with a south-westerly gale would inevitably go on shore. At the south side of the head of the bay is a fresh-water stream of considerable size, which boats can enter at high water, and find shelter in.

Directions.—Intending to anchor in the bay, bring the entrance to bear N.E., and steer for it, anchoring in 7 or 9 fathoms near the middle, with the entrance points bearing South and West.

Sea Otter cove, just west of San Josef bay, is about one mile long in a northerly direction, and from 2 to 3 cables wide. There are 5 fathoms in the entrance, and from one to 3 fathoms inside it, also several rocks ; the shelter within is very indifferent, and the

See chart, No. 582.

place only fit for a coaster. Off its south-east entrance point, and separating the cove from San Josef bay, are some small islets extending nearly one mile from the shore ; they are bare and yellow-topped, about 40 feet high, and conspicuous from the north-west.

CAPE RUSSELL, 16 miles from Rugged point and immediately westward of Sea Otter cove, is a remarkable headland 870 feet high, and the outer part of a peninsula formed by Sea Otter cove and a small bay north-west of it ; some rocks, on which the sea breaks very heavily, extend nearly one mile south of the cape.

From cape Russell to cape Scott the coast, from 500 to 600 feet high, trends in a north-westerly direction and is indented by three open bays which are nearly one mile deep but afford no shelter whatever.

See chart, No. 582.

CHAPTER X.

COAST OF BRITISH COLUMBIA (INNER CHANNELS)—QUEEN CHARLOTTE SOUND TO SEAFORTH CHANNEL.

VARIATION in 1898.

Queen Charlotte sound, $24^{\circ} 30' \text{ E.}$ | Seaforth channel, $25^{\circ} 30' \text{ E.}$

THE INNER CHANNELS, herein described, of the seaboard of British Columbia afford smooth water, together with anchorages for vessels of moderate length, at suitable distances.

See pages 16 to 18 for routes usually followed.

These channels, therefore, offer facilities to steam-vessels for avoiding the strong gales and thick weather so frequently met with in Hecate strait. They are also available for fore-and-aft schooners, when navigating between Vancouver island and Alaska.

Unless directed to the contrary, the mid-channel course is recommended to be kept when navigating these inner waters.

CAPE CAUTION (Ka klees la), the north entrance point of Queen Charlotte sound, is of moderate height and level, the tops of the trees being about 200 feet above the sea; the shore is white, and of granite formation, with a few rocks off it; the land north-east of the cape rises gradually in a distance of 5 miles to Coast nipple, 1,350 feet high, 2 miles eastward of which lies mount Robinson, 2,100 feet high.*

Position.—Cape Caution is situated in latitude $51^{\circ} 9' 39' \text{ N.}$, longitude $127^{\circ} 48' 5'' \text{ W.}$

SEA OTTER GROUP, consisting of several dangerous rocks, islets, and shoals which cover a space of about 12 miles in extent north and south and 10 miles in an east and west direction, lies at a

* *See* Admiralty charts:—Vancouver island, and views. No. 1,917; scale, $m = 0.15$ of an inch. Cape Caution to port Simpson, southern portion. No. 1,923 b; scale, $m = 0.25$ of an inch.

distance of 6 or 7 miles from the seaboard of British Columbia, fronting the coast between capes Caution and Calvert.*

Danger shoal, on which the sea is reported to break in heavy weather, is the southernmost outlying danger of Sea Otter group, and lies $10\frac{1}{2}$ miles W. by S. $\frac{1}{2}$ S. from cape Caution; near the centre of this shoal a depth of 9 fathoms, rocks and stones, was obtained, with 22 fathoms close around. Shoaler water probably exists.

The south extremes of Egg and Table islands in line, bearing N.E. $\frac{3}{4}$ N., leads clear to the south-eastward of Danger shoal and all other dangers on the south-east side of Sea Otter group.

Virgin rocks, near the western limit of the group, consist of three white rocks, the largest of which (50 feet high) lies 17 miles West from cape Caution. Southward of these rocks the 30-fathoms line is 4 miles, and in a westerly direction it is 6 miles distant; rounding the rocks to the westward do not stand into less than 30 fathoms.

Watch rock, 74 feet high and black, lies near the northern limit of the group, $7\frac{1}{2}$ miles N. $\frac{3}{4}$ E. from Virgin rocks. The rock is steep-to.

Pearl rocks, the northernmost of Sea Otter group, comprise several rocks above and below water, extending $1\frac{1}{2}$ miles in a north-west and south-east direction; the largest rock (15 feet high) lies 3 miles E. by N. from Watch rock, and the south-east rock, on which the sea always breaks, lies one mile S.E. by E. from the largest rock.

Devil rock, the north-eastern outlying danger, lies $1\frac{1}{2}$ miles N.E. $\frac{1}{2}$ E. from the largest Pearl rock. The sea seldom breaks on Devil rock, and there is apparently deep water close around.

New patch, on which the sea generally breaks, is nearly 2 miles in extent, and lies $4\frac{1}{2}$ miles S. by E. from the largest Pearl rock.

Channel reef, the easternmost danger of Sea Otter group, has about 6 feet over it at low water; from the centre of this reef Egg island bears E. $\frac{1}{4}$ N., distant $4\frac{2}{10}$ miles. The sea seldom breaks on Channel reef, and there are 60 fathoms close eastward of it.

Addenbrooke island open of, and the east shore of Fitzhugh sound (beyond) shut in by, cape Calvert bearing N.N.W. $\frac{1}{4}$ W., will lead midway between Channel reef and Egg island, and up to the

* See Admiralty chart:—Approaches to Fitzhugh and Smith sounds, No. 2448; scale, $m = 1\frac{1}{10}$ inch.

entrance of Fitzhugh sound. Allowance should be made for tidal streams: the flood sets to the eastward into Queen Charlotte and Smith sounds with a velocity at springs of nearly 2 knots.

Hannah rock, the south-easternmost outlying danger, on which the sea nearly always breaks, is situated about $2\frac{3}{4}$ miles South of Channel reef; Hannah rock is awash at high water, and from its centre, cape Caution bears E. $\frac{3}{4}$ S., distant 8 miles.

Caution.—Dangerous rocks have been reported as lying in a S.W. by S. direction, 5 miles from Danger shoal, and occupying a space of $2\frac{1}{2}$ miles in diameter, but their existence is doubtful.

SOUTH PASSAGE, leading to Smith and Fitzhugh sounds from the southward, lies between cape Caution and the south-east limit of Sea Otter group, where it is about 7 miles broad, with irregular depths varying from 34 to 74 fathoms.

Blunden bay, a slight bend in the coast between cape Caution and Neck point, at 2 miles N.W. $\frac{3}{4}$ N. from the former, is about one mile wide at its entrance, and nearly one mile deep. Indian cove, which lies in the northern part of this bay, affords good shelter for boats; it is the rendezvous for Indians on their canoe voyages, when passing between Queen Charlotte and Fitzhugh sounds.

Hoop reef.—From Neck point the coast trends N. by W. for 2 miles to Good Shelter cove, midway between which lies Hoop reef, about one-third of a mile from the shore; this reef is three-quarters of a mile in extent north-west and south-east, and a quarter of a mile broad.

South Iron rock, on which the sea seldom breaks, lies three-quarters of a mile westward of Hoop reef, and nearly $1\frac{3}{4}$ miles N.W. $\frac{1}{2}$ W. from Neck point.

North Iron rock, which dries 7 feet, lies nearly in the fairway of Alexandra passage, three-quarters of a mile N.N.W. $\frac{1}{4}$ W. from South Iron rock; there are 7 to 9 fathoms close to.

Clearing marks.—False Egg island in line with West rock off Table island, bearing N. by W. $\frac{1}{2}$ W., leads 4 cables west of South and North Iron rocks. The west extreme of Surf islet, and the small islands near the south point of Shower island in line bearing N.E. by N. leads through Alexandra passage, between North Iron and Egg rocks.

EGG ISLAND, immediately fronting Smith sound, and standing boldly out from the coast, is the prominent landmark between Goletas channel and Fitzhugh sound. The island is 280 feet high, covered with trees, and is remarkable for its egg-like shape; it lies 5 miles N.W. $\frac{1}{4}$ N. from cape Caution. From the south-west side of the island rocks extend about one cable, and on the east side is a small island, which is separated from Egg island by a narrow gully, giving the appearance of a split in the island itself, when seen from north or south.

Egg rocks, on the north-west side of Alexandra passage, are a cluster of rocks, lying nearly three-quarters of a mile W.N.W. from North Iron rock, and about 2 cables S.S.E. from Egg island; these rocks extend about a quarter of a mile N.N.W. and S.S.E., the northernmost being 30 feet high.

Denny rock, a sunken danger on which the sea seldom breaks, and a source of danger in thick weather, lies a quarter of a mile W.S.W. from the southernmost Egg rock. The west extreme of Ann island open west of Egg island bearing N. by E. leads about 3 cables west of Denny rock.

SMITH SOUND, 6 miles N.N.W. from cape Caution, is about 8 miles long N.E. and S.W., with an average breadth of $3\frac{1}{2}$ miles, the entrance between Jones and Long points being $4\frac{1}{2}$ miles across in a N.N.W. direction. At 6 miles within the entrance, on either side of a cluster of islands, is a channel leading into Smith inlet. In almost every part of the sound the depths are over 40 fathoms, and there is generally a heavy swell.

The south-east shore of Smith sound, for 4 or 5 miles from the entrance, is skirted by several small islands and rocks having deep water close-to; good shelter for boats will be obtained in a small cove about a quarter of a mile north of Jones point, the south entrance point of the sound; also in a cove one mile south of Jones point, abreast Egg rocks.

The entrance to the sound is protected by a rocky plateau (Cluster reefs) and several islands, islets, and rocks; some above, and many under water, prominent amongst them being Egg and Table islands. Access to Smith sound may be had on either side of these islands.

Alexandra passage, the continuation of South passage into Smith sound, lies between Egg island and the south-eastern point of entrance, the narrowest part between Egg rocks and North Iron rock being 6 cables; here as elsewhere, however, the dangers are so steep-to that the quickest use of the lead is enjoined.

A general leading mark through Alexandra passage (making allowance for heave of swell and tide) is the west extreme of Surf islet in line with the islets near the south point of Shower island bearing N.E. by N.

Beaver passage.—The northern channel into Smith sound lies between the islands skirting the north point of the sound, and Wood and White rocks, the northern and north-western extension of the above-mentioned plateau. In Beaver passage the bottom is irregular, 20 fathoms being the least depth obtained.

The course through the passage is E. $\frac{1}{4}$ S.; the east extreme of Search islands, just open of the west end of Surf islet on that bearing, leads in midway between John rock (on south side) and False Egg island (on north side), where the width is 6 cables.

This western entrance to the passage being the narrowest part, with the usual amount of sea or swell good steerage and vigilant attention are required.

White rocks, 35 feet high, and very conspicuous, lie in the west entrance of Beaver passage, at $3\frac{1}{4}$ miles N. by W. $\frac{1}{4}$ W. from Egg island, and nearly one mile N.W. of Cluster reefs.

John rock.—At 3 cables N.N.W. $\frac{3}{4}$ W. from White rocks, and 7 cables S. by W. $\frac{3}{4}$ W. from False Egg island, lies John rock, which dries 3 feet at low water, with 9 to 20 fathoms close around, forming the north-western danger on the south side of Beaver passage.

FALSE EGG ISLAND, resembling Egg island in shape, but smaller, is 150 feet high; it lies on the north side of Beaver passage, and is the outlying landmark for this northern entrance to Smith sound.

James rock.—At about 3 cables W. $\frac{1}{4}$ N. from False Egg island lies James rock, the exact position of which is somewhat doubtful; the sea breaks on this rock at low water, and between it and False Egg island the bottom is foul.

The west part of the large Canoe rock bearing North, or in line with Quoin hill (on Penrose island), passes three quarters of a mile westward of James and John rocks, and leads clear (westward) of all dangers at the entrance of Smith sound.

Table island, the largest of the group occupying the entrance to Smith sound, is about one mile long north and south, and half a mile broad, with the tops of the trees 120 feet above the sea, nearly flat, but when seen from abreast cape Caution appears to have two hills.

A cluster of rocks, several of which are covered at low water, extend half a mile from the west side of Table island, having 24 fathoms close to the outer rock.

Ann island, about half a mile in extent, is separated from the north end of Table island by a channel (one cable wide in some parts) in which shelter will be found for boats.

Cluster reefs, consisting of several rocky heads and shoal patches, extend from Table island in a northerly and north-westerly direction into the entrance of Smith sound.

George rock, on which the sea breaks at low water, is the north-westernmost of the reefs, and lies one mile N. by W. $\frac{3}{4}$ W. from Ann island.

Edward rock dries 7 feet and lies E.N.E. nearly three-quarters of a mile from George rock.

Wood rocks, which are awash at low water, situated nearly a quarter of a mile E. by N. from Edward reef, consist of three rocky heads, and are the north-easternmost of Cluster reefs.

Bertie rock, with $3\frac{1}{2}$ fathoms water on it, lies near the eastern edge of Cluster reefs; from the centre of this rock the north-west extreme of Ann island bears S.W. $\frac{3}{4}$ S., distant nearly three-quarters of a mile.

The west extreme of False Egg island in line with Kelp head, bearing N. $\frac{3}{4}$ W., leads westward; and Limit point midway between Long and Shower islands, bearing E. by N. $\frac{3}{4}$ N., leads northward of Cluster reefs.

Tidal streams.—Allowance should be made for tidal streams: the flood sets to the eastward into Queen Charlotte and Smith sounds with a velocity at springs of nearly 2 knots.

LONG POINT, the north-west point of Smith sound, lies E. by N. three-quarters of a mile from False Egg island; Tie island, which is nearly a quarter of a mile in extent, lies close westward of Long point, and is separated from it by a boat passage, in which there is a depth of 4 fathoms. Ada rock, which is awash at low water, lies 2 cables S.S.E. $\frac{1}{2}$ E. from Tie island.

Position.—Long point, lat. $51^{\circ} 19' N.$, long. $127^{\circ} 47' 30'' W.$

Brown island, on the north-east side of Beaver passage, lies half a mile S.E. $\frac{1}{2}$ S. from Long point; the island is 250 feet high, nearly half a mile long N.N.W. and S.S.E., and a quarter of a mile broad, with 17 to 23 fathoms close to its south point.

Surprise patch, on the north side of Smith sound, lies $1\frac{3}{4}$ miles N.E. by E. $\frac{1}{4}$ E. from the south extreme of Brown island; there is a depth of 5 fathoms on this patch, 7 to 17 fathoms close around.

Judd rock, with less than 6 feet water on it, lies three-quarters of a mile N.E. by E. $\frac{1}{2}$ E. from Surprise patch, and three-quarters of a mile W. by N. from Long island, the largest of the Barrier islands.

Barrier islands, at the head of Smith sound, comprise several small islands covering a space of about 5 miles in extent N.E. and S.W. Blakeney passage on the north, and Browning passage on the south side of these islands leading to Smith inlet, are each about one mile wide, with no bottom at a depth of 40 fathoms. A reef extends 4 cables E.N.E. from the east end of Central island.

TAKUSH HARBOUR, on the south shore of Smith sound, 6 miles within the entrance, is 2 miles long, north-east and south-west, and one mile broad; and is the only anchorage to which a ship can resort for shelter when crossing Queen Charlotte sound. Vessels of large size can lie securely here.

The entrance is three-quarters of a mile wide, and has depths of 22 fathoms, rocky bottom, in the centre of Ship passage, which is $2\frac{1}{2}$ cables wide, and is formed by Gnarled islands on the west, and Fish rocks (dry 3 feet at low water) on the east side. There is an Indian village here of the Quascilla tribe, but the lodges are wretchedly constructed and the people miserably poor.

* See Admiralty plan:—Takush harbour, on chart Approaches to Fitz Hugh and Smith sounds, No. 2,448; scale, $m = 1.0$ inch.

Petrel shoal, on which there is a depth of 15 feet, situated one cable S.S.E. $\frac{3}{4}$ E. from the easternmost Gnarled island, is the principal danger in rounding into Anchor bight.

Fly basin, at the head of Takush harbour, perfectly land-locked, is about one mile long E.N.E. and W.S.W., and one to 2 cables broad, with $2\frac{1}{2}$ to 3 fathoms in the western and 6 to 8 fathoms in the eastern part of the basin. The entrance to Fly basin, which is about one cable wide, is contracted to a quarter of a cable by a shoal extending from the east entrance point, with a rock (dry 2 feet at low water), and a patch of 9 feet on its western edge; between this shoal and the west entrance point there is a depth of 9 fathoms. If required a small vessel could be taken into Fly basin.

Anchorage in Takush harbour will be found in 10 or 11 fathoms, mud, in Anchor bight, midway between Ship rock and Steep point, with the north extreme of Bull point in line with Anchor islands, bearing N.E. by E. $\frac{1}{2}$ E., and east extreme of Bloxham point N. by E. $\frac{1}{2}$ E.

Tides.—It is high water, full and change, in Takush harbour at 1h. 0m.; springs rise 14 feet, neaps 11 feet.

Directions.—When bound to Takush harbour, it is recommended to pass through Browning passage, and, after passing North point, keep the north extreme of Bright island a little open north of that point bearing W. by S. $\frac{1}{4}$ S., until Berry point (south side of Fly basin) appears midway between the entrance points of Fly basin, S.E., which will lead through Ship passage; and when Steep point is well open of the southernmost Gnarled island bearing W.S.W. a course may be steered for the anchorage in Anchor bight, taking care to avoid the shoal ground south of Gnarled island, passing midway between Anchor and Gnarled islands. Good steerage is required here, speed should be proportionately slow, the leads kept quickly going, and the water not shoaled to less than 7 fathoms.

SMITH INLET (Quas cillah), the continuation of Smith sound, is about 3 miles wide at its entrance, between the eastern part of Takush harbour and Dsoolish bay; it is said to extend nearly 25 miles in an E.N.E. direction, and at about 9 miles from its entrance contracts to a general width of half a mile, the shores being formed of high,

rocky precipices covered with wood. The inlet has not been surveyed.

The eastern arm of Smith sound has deep water, and no known dangers within. On the southern side of the entrance are Round and Dot islands, both wooded. About 6 miles up, on the southern shore, is cape Anne, eastward of which is Quashela bay, visited by Vancouver.

A rock, which dries at low water, lies one cable E. by N. $\frac{1}{2}$ N. from cape Anne, with a depth of 9 fathoms close eastward. Quashela bay is reported to afford safe but confined anchorage in the southern bight, in 22 fathoms.

On the northern shore, opposite cape Anne, is a land slide, and a thickly-wooded point facing westward, which has the appearance of a cone from a vessel going up the inlet. The vessels of the Hudson's Bay Company anchor in 45 fathoms, rocky bottom, with the stern warped to trees onshore, off the entrance of an inlet $1\frac{3}{4}$ miles eastward of cape Anne; this anchorage is bad. A cannery is situated about half a mile up the inlet, from which scows bring cargo down to vessels at the entrance.

The coast from Long point extends $2\frac{1}{4}$ miles N.W. by N. to Kelp head, from which Cranstown point bears N. by W. distant one mile.

FITZ HUGH SOUND, the entrance to which lies 3 miles northward of Smith sound, is 39 miles long in a general N.N.W. and S.S.E. direction, having an average breadth of 3 miles. The shores are mostly bold and rocky, the slopes are wooded and steep, and the elevation of the peaks from 1,000 to 3,400 feet. The southern entrance to Fitz Hugh sound lies between Cranstown point (the south-east entrance point of Fitz Hugh sound and south entrance point of Rivers inlet) and cape Calvert, the southern extremity of Calvert island, which bears from Cranstown point W. $\frac{1}{2}$ N. distant 5 miles.*

The sound at 4 miles north of Safety cove is contracted to $1\frac{1}{2}$ miles in width by Addenbrooke and adjacent islands, which lie on the east side; the shores on both sides are, however, steep-to, and the depths in the channel from 80 to 140 fathoms.

Tidal stream.—The flood tide runs to the northward.

See charts, Nos. 1,923b, 2,448.

Canoe, Spur, and Paddle rocks lie about one mile off Kelp head, and occupy a space of $1\frac{1}{2}$ miles in a N.N.W. and S.S.E. direction; the space thus enclosed being foul, and more or less covered with growing kelp. Canoe rock, the centre and most prominent of these rocks, is bare, 25 feet high, and stands boldly out from the coast, making a good point for identification.

Open bay, on the north-east side of Cranstown point, affords anchorage in 7 fathoms, about 2 cables from the shore, during summer or with off-shore winds, but there is generally a swell in the bay, and it is only used by local craft as a temporary anchorage.

Cape Calvert, the south extreme of Calvert island, is the southern termination of Cape range (2,000 feet high); it presents a broad face of rocky coast extending in a north-east and south-west direction, about 350 feet high, and covered with a thick growth of hemlock and pine trees. At 2 miles North of the cape is Entry cone (1,200 feet high), which is conspicuous, and forms a good mark for recognising Fitz Hugh sound from the southward and westward; cape Calvert is fronted by the Sorrow islands, which are steep-to, of granite formation, and covered with gnarled and stunted trees; between these islands and the cape fair shelter may be found for boats in Grief bay (Telakwas), but during south-east or south-west gales, a swell is more or less experienced, rendering landing difficult and sometimes dangerous. Indians resort to Grief bay when travelling, or engaged in hunting the sea otter.

Those from the westward, bound for Fitz Hugh sound, should use North passage, between Sea Otter group and Calvert island; this passage is about 3 miles wide, Hedley patch with 9 fathoms water (possibly less) lies in the west entrance to North passage, at $3\frac{1}{2}$ miles N. $\frac{1}{4}$ W. from Watch rock.

Cape Calvert is situated in latitude $51^{\circ} 25' 0''$ N., longitude $127^{\circ} 55' 0''$ W.

SCHOONER RETREAT (Ka pi lish), on the east side of Fitz Hugh sound, is the name given to the anchorages among a cluster of islands at the south-west part of Penrose island, which here separates Fitz Hugh sound from Rivers inlet. The Retreat affords a secure stopping place, and with care may be safely entered by steam-vessels. Karlake point (Joachim island) its south-eastern entrance point, lies 7 miles N.E. $\frac{1}{2}$ N. from Sorrow island. The

entrance to Schooner Retreat trends in a N.N.E. direction from Karlslake point, where it is about half a mile wide, contracting to one cable between Sea bluff and Grey islets; inside the narrows to the eastward, it expands into Frigate bay.*

Penrose island, which forms the northern protection to Schooner Retreat, lies in the mouth of Rivers inlet, a branch of the inlet passing on either side of it. Quoin hill, 880 feet high, is situated near its south end about three-quarters of a mile inland

Joachim island, the south-easternmost and largest of the cluster of islands at the south-west end of Penrose island, is 400 feet high, $1\frac{1}{4}$ miles long north and south, with an average breadth of half a mile; the north extreme of this island is separated from Penrose island by a boat passage.

Ironside island, the eastern part of which is 200 feet high, is the next in size, and is separated from Sea bluff, the north-west point of Joachim island, by the channel into Schooner Retreat. Grey islets on the west side of the channel into Schooner Retreat, lie close off the south-east extreme of Ironside island.

Safe entrance, between Joachim and Ironside islands, three-quarters of a mile wide, has in the middle from 8 to 17 fathoms water. On the west side of Safe entrance, about 50 yards from Grey islets, lies a rock awash; from it shoal ground extends $1\frac{1}{2}$ cables in a northerly direction, with 2 to 3 fathoms on it, and 4 to 10 fathoms close-to.

Comber rock, on which the sea often breaks, is an outlying danger at the north side of Safe entrance; the rock covers at three-quarters flood, and lies three-quarters of a cable S. by W. from Surf point, the south-west extreme of Ironside island.

Frigate bay, the southernmost anchorage in Schooner Retreat, is about half a mile long north-east and south-west, and a quarter of a mile broad, with depths of 9 to 20 fathoms; it is formed by the junction of Joachim and Penrose islands on the south, east, and north, and is protected on the west by Ironside and Maze islands. Centre islet, in the north part of the bay, of small extent, lies $2\frac{1}{4}$ cables from the north end of Safe entrance; a shoal with from 2 to 3 fathoms on it, extends for more than one cable from its east end

* See Admiralty plan:—Schooner Retreat, on sheet of plans of anchorages between Cape Caution and Port Simpson, No. 1,901; scale, $m = 60$ inches.

in a north-easterly direction towards Penrose island. There are several other islets and rocks in the eastern part of the bay, from which a boat passage leads into Rivers inlet.

The best anchorage in Frigate bay will be found just within Safe entrance, off a clean sandy beach, in 13 fathoms, with the north-east extreme of Ironside island bearing W. $\frac{1}{2}$ S., and the north-west extreme of Sea bluff S. $\frac{1}{4}$ W. Vessels should moor.

Maze islands are a cluster of small islands on an extensive shoal projecting in a northerly direction from the north-east end of Ironside island; the north-east prong of this shoal extends nearly across to Penrose island, leaving a narrow channel with $5\frac{1}{2}$ to 9 fathoms water, which leads from Frigate bay to Secure anchorage.

Secure anchorage, north-west of Frigate bay, is about a quarter of a mile long north-east and south-west, and $1\frac{1}{2}$ cables broad, with depths of 9 to 11 fathoms; it is protected from seaward by Ironside, Bird, and Highway islands. Verney passage, leading to Secure anchorage from the westward, between Ironside and Bird islands, is nearly half a cable wide with 7 fathoms in mid-channel, but it is contracted to about 30 yards by the shoals on either side, and is only suitable for small coasting vessels. Chance rock, at the entrance between Folly and Stunted islands, renders this passage dangerous.

Directions.—When bound to Schooner Retreat at all times use Safe entrance; from the southward, Quoin hill (880 feet high) at the south part of Penrose island, should be brought in line with the hill 200 feet high, on the east end of Ironside island bearing N.N.E., this will lead to abreast Karlake point, the west extreme of Joachim island, when Safe entrance will be open. After passing Karlake point steer very carefully and proceed at a moderate speed towards Sea Bluff point until Quoin hill is in line with Centre island bearing N. $\frac{3}{4}$ E., which will lead through Safe entrance in mid-channel, and to the anchorage in Frigate bay.

Gales.—During S.E. and S.W. gales the gusts are furious, but with good ground tackle and care there is no danger in Schooner Retreat.

Tides.—It is high water, full and change, in Schooner Retreat at 0h. 30m.; springs rise 14 feet, neaps 11 feet.

RIVERS INLET, the shores of which have not been surveyed, has an entrance on either side of Penrose island, but it is not known whether they are clear of danger. The inlet runs about 12 miles in a northerly direction, and then 10 miles north-eastward to the mouth of Wannock river. Zero and Black rocks are dangers at the entrance of the inlet, the former is a small rocky islet, composed of white limestone, about 15 to 20 feet above high water, and about 2 cables in extent; the latter is a low, smooth, black rock, about 50 yards long, and 3 or 4 feet high; with foul ground between it and the island to the northward.*

A rock, with a depth of 4 fathoms on it, lies with Zero rock centre bearing N.E., distant 8 cables.

Pass north-westward of Zero rock, and south-eastward of Black rock, about one cable off each, in deep water.

Schooner passage, the entrance to which from Rivers inlet is on the western shore, about 10 miles up the inlet, and westward of Walbran island, has deep water, with low and densely-wooded shores. This passage has an uniform breadth of about 2 cables, and is frequently used by the Hudson's Bay Company's steam-vessels; but it is not suitable for vessels more than 240 feet in length. There is a sunken rock at the western entrance of the passage, to avoid which sharp turns are necessary; and the northern shore should be kept very close aboard. A rock lies 70 yards off shore on the western side of the northern entrance.

Good anchorage is reported in the north-western bight, in 10 to 20 fathoms, where the inlet turns to the eastward. Wannock cannery is on the northern shore about 2 miles eastward of this bight. At the mouth of Wannock river the village Oweekayno is situated on both sides, and a saw-mill, cannery, and a wooden church are on the south side. The water is too deep for anchorage off Oweekayno. The least water on the bar of the Wannock is 7 feet at low water abreast the church, and the mark for entering is to keep a land slip, the middle of three situated about one mile south-westward of the church, bearing S.S.W. $\frac{3}{4}$ W. astern. There is a wharf at the saw-mill with a depth of 12 feet alongside. A mail steamer calls at the establishments in Rivers inlet once a month.

Swan Rock is about a quarter of a mile in length W. by N. and E. by S., with depths of $1\frac{1}{4}$ fathoms on it, and lies with Lone island centre bearing East, distant $1\frac{3}{10}$ miles; and Entry cone S.S.W.

Addenbrooke island.—At about 8 miles N.W. from Karslake point lie a group of islands off the eastern shore of the sound abreast an unexplored opening. Addenbrooke, the westernmost of these

islands, extends westward into the sound narrowing the width of the passage between it and Calvert island to about $1\frac{3}{4}$ miles.

SAFETY COVE (Oat so alis), on the west shore of Fitz Hugh sound, 7 miles northward of cape Calvert, is about one mile long W.S.W. and E.N.E., and nearly half a mile wide at its entrance, westward of which the shores of the cove extend parallel to each other at 2 cables apart; there are depths of 9 to 17 fathoms within half a cable of its shores, and 14 to 19 fathoms, soft mud, in the middle of the cove; a bank of sand and mud which dries, extends 3 cables from the head with 7 fathoms close to its edge.*

The shores, except near the head are high, rocky, and steep-to, rising to an elevation of about 1,000 feet. There is a conical peak at the head of the cove which bears W. $\frac{1}{2}$ S. from the middle of the entrance. North entrance point of Safety cove has two small islets lying off it, which are useful in identifying the entrance, especially when coming from the northward.

Anchorage.—Good anchorage will be obtained in 13 fathoms, mud bottom, in the middle of Safety cove abreast a waterfall on the north shore. Entering at night, keep in the middle of the cove, and keeping the lead going anchor as soon as 17 fathoms are struck. During south-east or south-west gales, strong gusts blow across the valley at the head of this cove.

Water.—The stream which flows into the head of Safety cove affords excellent water, but is difficult to obtain by boats. The waterfall on the north shore, unless in exceptionally dry weather (August and September), will afford a good supply.

Tides.—It is high water, full and change, in Safety cove, at 1h. 0m., springs rise 14 feet, neaps 11 feet.

Kwakshua passage, between Calvert and Hecate islands, $7\frac{1}{2}$ miles north of Safety cove, leads to the sea; this passage is only partially examined; it has, however, been used by coasting vessels. (See page 492.)

Hakai channel is $5\frac{1}{2}$ miles north of Kwakshua, between Hecate island and the smaller islands lying off the south side of Hunter island, leading to sea. Vancouver reached the sea by this passage in 1792. (See page 492.)

GOLDSTREAM HARBOUR, at the south-east entrance point

See chart, No. 1,923b.

* See Admiralty plan :—Safety cove, on sheet of plans of anchorage, between cape Caution and port Simpson, No. 1,901; scale. $m = 4.0$ inches.

of Hakai channel, affords good accommodation for small vessels; it is about 2 cables long north and south, and 2 cables broad, with depths of 7, to 15 fathoms, sand and mud. The entrance to this harbour from Fitz Hugh sound is through an intricate passage little over half a cable wide, between the north extreme of Hecate island which forms the south shore, and an island about one mile in extent which forms the north side of Goldstream harbour.*

Foul ground marked by kelp, extends one cable from Kelp point, the north entrance point of the harbour. Evening rock, which dries 3 feet at low water springs, lies near the middle of the passage about 2 cables within the entrance on the north side of the channel; it would, therefore, be advisable, in the absence of good local knowledge, to place a boat near this rock (when covered) before entering or leaving the harbour, and proceeding at slow speed, keep in mid-channel, where there is a general depth of 6 fathoms.

Tides.—It is high water, full and change, in Goldstream harbour at 1h. 0m.; springs rise 15 feet, neaps 12 feet.

Nalau island, separating Nalau and Hakai passages, is $4\frac{1}{2}$ miles long north and south, 3 miles wide, and 650 feet high; it is situated between Hunter and Hecate islands.

Nalau passage, 4 miles north-westward of Hakai, is an unexplored channel leading to sea. (*See* page 494.)

NAMU HARBOUR, at the south entrance of Burke channel and one mile south of Edmund point, on the east side of Fitz Hugh sound, lies 6 miles N.E. by N. from Nalau passage, the intervening east shore of Fitz Hugh sound being abrupt and bold. It is three-quarters of a mile long, E.N.E. and W.S.W., and three-quarters of a mile broad, with depths of 20 to 28 fathoms; at its entrance lies Kiwash, a round island, 200 feet high, a quarter of a mile in diameter, and covered with trees.†

South passage, between Kiwash and Plover islands (150 feet high) the latter forming the south entrance point, is nearly half a mile wide, with 23 to 28 fathoms; North passage, between Kiwash and Cliff islands, on the northern side of the harbour, is 3 cables wide with 35 to 18 fathoms. Namu harbour may be entered either by North or South passage.

See chart, No. 1,923b.

* *See* Admiralty plan:—Goldstream harbour on sheet of plans of anchorages between cape Caution and port Simpson, No. 1,901; scale, $m = 60$ inches.

† *See* Admiralty plan:—Namu harbour on sheet of plans of anchorages between cape Caution and port Simpson, No. 1,901; scale, $m = 40$ inches.

From the north side of Namu harbour two inlets indent the land about one mile; the western is named Harlequin basin, the other, which is choked with rocks, is called Rock creek. At the mouth of the latter is Whirlwind bay, its entrance being marked by two small islands, Sunday island to the northward, and Clam island to the southward a quarter of a mile apart. Two or 3 miles eastward of the harbour a chain of mountains from 2,600 to 3,300 feet high extends in a N.N.E. and S.S.W. direction for 6 miles.

Anchorage.—Large vessels should anchor in 20 fathoms, in the centre of Namu harbour, with the north extreme of Kiwash island bearing West, and the west extreme of Plover island S. by E. Small vessels may anchor in Whirlwind bay in 12 fathoms, clay, with the north extreme of Kiwash island bearing W. by S., and the centre of Clam island South.

During the autumn and winter months the anchorage in Whirlwind bay is not recommended, as furious gusts blow over the mountains (3,000 feet high) in its vicinity. This anchorage is moreover confined by Loo rock, on which there is only 3 feet water, lying nearly in the middle of the bay, 2 cables E. by N. $\frac{1}{2}$ N. from the south extreme of Sunday island. It is recommended not to bring Sunday island to bear westward of W.N.W. when entering Whirlwind bay.

There is a large stream and an old Indian camp in Whirlwind bay.

Tides.—It is high water, full and change, in Namu harbour at 1h. 0m.; springs rise 15 feet, neaps $12\frac{1}{2}$ feet.

BURKE CHANNEL, an inlet on the east side of Fitz Hugh sound, 3 miles northward of Namu harbour, leads to Bela kulu anchorage at the head of North Bentinck arm, a distance of 55 miles in a general north-easterly direction, from its junction with Fitz Hugh sound. Burke channel lies between high, precipitous, rocky mountains, the sides of which are covered with stunted pine trees, and mostly snow-capped, becoming more lofty as the head of the inlet is approached. Burke channel and Bentinck arm, though not surveyed in detail, have been frequently traversed both by day and night.*

Edmund point, the south entrance point of Burke channel, is low and wooded, and has several small islands south of it, lying off

* See chart, No. 1,923b.

an indentation, which has the appearance of affording sheltered anchorage. Some small islets also lie in the channel, eastward of Edmund point.

Walker point, the north entrance point to the channel, is formed by an island situated 2 miles N.W. from Edmund point; this island is steep-to, but at 2 cables the water is not deeper than 26 fathoms, mud bottom, deepening quickly a short distance further; a position which might be used for anchoring in a fog.

Temporary anchorage, north of Walker point, might on emergency, with care, and sending a boat ahead, be taken up, but there are many covering reefs.

The first reach of Burke channel takes a N.N.E. $\frac{1}{2}$ E. direction for 5 miles, and thence N.E. $\frac{3}{4}$ E. for $3\frac{1}{2}$ miles, the first part being a little over one mile wide, but the latter part only three-quarters of a mile across. The tidal streams are strong in this reach, and several heavy tide rips are met with; but for the remainder of the distance to Bela kula they are not much felt. Immediately facing the eastern end of this reach is a bay which might possibly afford anchorage. The sea water here is brackish.

Restoration bay (Tsekwai), at 4 miles from the N.E. point of the first reach is situated immediately under a high, conical mountain, and has a sandy beach at its head, off which, at half a mile, is a depth of 40 fathoms shoaling gradually to 3 fathoms close to the shore. Several small streams enter the cove. Anchorage may be taken up in 18 fathoms at about $1\frac{1}{2}$ cables from low water mark: the shore should be approached very slowly when coming to an anchor, as the bank is extremely steep-to and the water shoals very suddenly.

The second reach of Burke channel trends N. by W. for $10\frac{1}{2}$ miles, ending abreast a low, wooded point at the foot of a high mountain; thence the channel takes a N.N.E. $\frac{3}{4}$ E. direction for 12 miles, another arm (Kwatna) branching off S.E. At one cable from the south-west point (Mapalaklenk) of entrance to this arm is a rock, which uncovers at low water: it is the only known danger in Burke channel, and may be avoided by keeping the north shore aboard.

Hence the channel takes a N.E. $\frac{1}{4}$ N. direction for 4 miles along the base of a remarkably bare, stony mountain situated on the south shore, which is almost entirely devoid of vegetation. Thence the

channel trends N.N.E. for 6 miles, at which distance Deane channel branches off N.W., Burke channel continuing for 7 miles N.E. by E. $\frac{1}{2}$ E., to Menzies point (Taliuko), in lat. $52^{\circ} 18' 30''$ N., where it divides into the north and south Bentinck arms, the former taking a N.E., the latter a S.E. direction.

North Bentinck arm is 8 miles long, and just within the entrance, on the north shore, is a small bay affording anchorage for small craft. The head terminates in a sand and mud flat fronting low, swampy ground, covered with grass, which is submerged at high water. The inlet is here $1\frac{3}{10}$ miles wide.

Bela kula at the head of North Bentinck arm, affords indifferent anchorage close to the mud flat at the mouth of the river, on the south side east of Suttlej point. When taking up a berth, great care is required. A large vessel should moor in 45 to 50 fathoms, as the bank is very steep-to, deepening from one to 18 fathoms in a distance of 200 feet; a stern anchor may also be required, or a hawser laid out to the shore will be useful for keeping the hawse clear. Small vessels may find shelter during summer, on the north shore under Custom house point. The country abounds in fur-bearing animals.*

Bela kula or Nookhalk river is a stream of considerable size and velocity, the deposit from which has formed the steep bank at the head of the inlet. The water is quite fresh alongside, and if pumped in at low water is fit for drinking. There are also several good places for watering at, on the north shore, opposite the anchorage, a boat being able to go underneath the waterfalls.

There is a Norwegian Settlement here.

Tides.—It is high water, at full and change, at noon; springs rise 13 feet.

Winds.—The prevailing wind in Bentinck arm in summer is from south-west; the westerly winds of the ocean blowing across Fitz Hugh sound being led up the inlet as through a funnel following the direction of the different bends. The breeze generally sets in about 10 o'clock in the forenoon, and blows fresh until sunset, when it usually falls calm.

South Bentinck arm.—From Menzies point, South Bentinck arm branches S.E., about one mile in breadth, with high land on both

See chart, No. 1,923b.

* *See Admiralty plan:—Bela kula anchorage on sheet of plans, No. 1,462; scale, " = 4'0 inches.*

sides, for about 20 miles. At 9 miles from Menzies point an island lies on the eastern shore. The head of the arm is reported to be shallow, 5 and 12 fathoms, but it has not been surveyed and is seldom visited.

Kiltik.—From Nalau passage the coast of Hunter island extends 12 miles in a N. by W. $\frac{1}{4}$ W. direction with only two openings, the northernmost of these named Kiltik on the west side of Fitz Hugh sound, opposite Edmund point, is a narrow creek (less than 2 cables), extending nearly one mile in a westerly direction, with an average depth of 20 fathoms in the centre, but shoal for one-third of a mile from its head. This creek, it is supposed, might be used by moderate sized vessels, but has not been examined in detail.

The Trap.—At 13 miles northward from the south-eastern point of Hunter island a small islet lies off an indentation of the coast, forming what has been termed the Trap. Strangers might be tempted to enter this opening; it is, however, extremely contracted, not affording room for a steam-vessel to turn, and dangers are supposed to exist in the passage round the island, it should therefore be avoided.

FISHER CHANNEL, the continuation of Fitz Hugh sound northward from the entrance to Burke channel, leads to Lama and Gunboat passages on the west, and to port John and Evans arm on the east. At 15 miles from Walker point Fisher channel divides into two, Johnson channel taking a N.N.W. and Cousins inlet a North direction; the former at a distance of 9 miles splitting into several arms (Roscoe and Sisters inlets on either side of Florence peninsula and Bullock and Ellerslie channels on either side of Yeo island). Bullock and Ellerslie channels communicate with Seaforth channel (*see* page 413), and from the north point of Yeo island, at their northern junction, the main inlet continues northward for a further distance of 10 miles to about lat. $52^{\circ} 37' N$. These channels northward of Gunboat passage have not been surveyed in detail, and should, therefore, be navigated with caution.

Fog rocks, situated rather on the east side of Fitz Hugh sound and 3 miles North of Walker point, consist of six rocks above water, flat and of a whitish colour, the highest of which is 25 feet high, with a few shrubs on it; close to the southernmost rock several small black rocks uncover at low water. These rocks (which appear nearly in mid-channel from the southward) may be passed on either side,

but the main route lies westward of them, passing them at about half a mile.

Walbran rock, with 12 feet on it at low-water spring tides, and 4 to 10 fathoms close around, lies with the south-east extreme of Pointer island at the entrance of Lama passage, bearing W. by N. $\frac{3}{4}$ N. distant $2\frac{3}{4}$ cables, and Brend point N. by E. $\frac{3}{4}$ E.

Tidal streams.—About midway between Fog rocks and Lama passage the flood tide from the northward meets that from the southward.

PORT JOHN.—At 4 miles North of Lama passage, on the eastern shore of Fisher channel, is an indentation, in the northern part of which, immediately under Remarkable cone mountain, 2,302 feet high, is port John, southward of which is Evans arm, into which there are two passages on either side of Matthew island, 360 feet high, which lies at the entrance to the arm. The south passage is half a mile wide, the north passage is only one-third of a mile wide, and this near the east end is contracted to $1\frac{1}{2}$ cables by a rock lying in the centre.*

Port John (of Vancouver) affords anchorage in 20 fathoms, but is much confined by Mark rock nearly in the middle, covering at half flood, and by a flat extending off the stream at its head. There is also anchorage at the head of Evans arm in 20 fathoms, which may be reached through South passage, but the immediate approach to it north of Boot island is foul, and a large vessel should be preceded by a boat. North passage should only be used after temporarily buoying Peril rock, which has 12 feet water on it, and lies nearly in the middle of the eastern part of the passage.

Tides.—It is high water, full and change, in port John, at 1h. 0m.; springs rise 13 feet.

DEAN CHANNEL leads out of Cousins inlet to the N.N.E., in which direction it extends for about 12 miles, and there divides into three branches; one (Cascade inlet) taking a north-west direction; another (Labouchere channel) to the south-east, and communicating with Burke channel (*see* page 404); the other, main inlet, extending in a north and north-east direction, with an average width of one mile for a distance of 18 miles, when it turns to the N.N.W. for 9 miles, terminating in low marshy land in about lat. $52^{\circ} 52' N.$ †

* *See* Admiralty chart:—Lama passage and Seaforth channel, No. 2,449; scale, $m = 1.55$ inches.

† *See* chart, No. 1,923b.

Kimsquit.—Bound for Kimsquit at the head of the channel, round Raphoe point at the distance of a quarter of a mile and steer up mid-channel. As the head is approached the village of Kimsquit, and the river and sand-bank off its entrance, will be seen on the eastern side; two miles above the river the inlet is contracted to about one mile in breadth by two low spits. Continue mid-channel between these spits and haul into the bay on the east shore, where anchorage will be found, off a pebbly beach, in 40 fathoms, with a large boulder on the north end of the beach bearing N. $\frac{3}{4}$ W., and the north-west point of the bay West.

Cascade inlet, so named by Vancouver, from the number of waterfalls, extends in a north-west direction for about 11 miles with an average width of three-quarters of a mile. It, in common with the other branches of Dean channel, has not been surveyed in detail; its shores are composed of precipices, and several large cascades come down from the high mountains that overlook it.

LAMA PASSAGE, between Hunter and Denny islands, is the main passage connecting Fisher channel (the northern continuation of Fitz Hugh sound) with Seaforth channel and Millbank sound; its eastern entrance on the west side of Fisher channel, 6 miles North of Fog rocks, may be recognised by a conical mountain 1,000 feet high, on the north-east point of Hunter island, and by Pointer island, on the south side of this entrance, where it is nearly one mile wide. Thence the passage trends West 2 miles to abreast Serpent point on the south shore, the breadth being about half a mile, and the depths 130 fathoms in the middle, 25 and 26 fathoms near the shores; it then widens and trends 4 miles W.S.W. to abreast Twilight point (the south-west point of Denny island.*

The entrance to Plumper channel (*see* page 495), which is one mile wide, lies opposite Twilight point, from which Lama passage turns to the north-west between Denny and Campbell islands, for 4 miles to Grave point, which has several Indian graves on it.

The north shore of Lama passage is bold, and a rock awash is reported to lie about one cable off-shore, W. $\frac{3}{4}$ N. from Serpent point. The southern shore, after the first 3 miles, is penetrated by a number of indentations, some of which afford shelter.

* *See* Admiralty chart:—Lama passage and Seaforth channel, No. 2,449. scale $m = 1.55$ inches.

COOPER INLET, situated on the southern shore of Lama passage, 5 m. ss from the eastern entrance, is deep, and contains several small creeks, the indentations already mentioned, off which lie a number of islets and rocks. In fine weather anchorage may be obtained in 14 fathoms under Westminster point.

Jane creek, in the south-east corner of Cooper inlet, may be used by small vessels. Charles point, its north point, has two reefs extending one cable from it in a north-westerly direction, the outer of which dries 9 feet.

Good anchorage may be had in this creek in 9 fathoms, with Charles point in line with the east point of Canal bight (on the opposite shore of the passage) bearing N.W. $\frac{1}{2}$ W., and George point, the south entrance point of Jane creek, bearing S.W. by W. Large vessels may anchor in about 18 fathoms midway between Charles and George points; the bottom in this creek is mostly rocky.

Camp island, lying close to the south-west extremity of Denny island, and the turning point into the northern part of Lama passage, should not be rounded nearer than half a mile, as the bottom is foul for 3 cables in a south-easterly direction from it, with patches that uncover 2 feet at low water springs.

McLAUGHLIN BAY, on the west shore of Lama passage, half a mile south of Grave point, is a good stopping place; it is about 4 cables wide and $1\frac{1}{2}$ cables deep, with 8 to 14 fathoms water. The south point of the bay has a bare hill 150 feet high, which in thick weather is an useful guide to a stranger. The anchorage is in 11 fathoms off the centre of the beach about one cable from the shore, with Grave point open east of south-west point of Narrows island bearing N. $\frac{1}{2}$ W., and Archibald point open east of Napier point bearing S.E. by E. A spit runs off with Bare hill bearing West. Anchorage should be taken up well to the southward of the church.*

In this bay is the site of an old Hudson bay trading post; there is a small quantity of cleared ground at the foot of a rocky hill 200 feet high, a quarter of a mile from the beach, on the west side of which there is a lake. This is the only Indian winter residence between Queen Charlotte sound and Seaforth channel.

See chart, No. 2,449.

* *See Admiralty plan:—McLaughlin bay, on sheet of plans of anchorages between Cape Caution and Port Simpson, No. 1,901; scale, 1" = 5.5 inches.*

The Bella Bella natives migrated here from Bella Bella islands in 1868; an American missionary now resides here, and there is a small church and school-house.

A rock is said, from Indian report, to exist in Lama passage abreast McLaughlin bay, and to lie half a cable from the eastern shore, with Napier point bearing S.S.E. distant nearly 6 cables; this reported danger has been searched for without success by several of H.M. ships. This passage was frequently used by the *Beaver* during the survey, and though not then found the rock may exist, and consequently the western shore should be favoured.

Tides.—It is high water at full and change in McLaughlin bay at 1h. 0m.; springs rise 14 feet, neaps 8 to 10 feet.

Bella Bella islands lie three-quarters of a mile north of Grave point, bare and about 15 feet high. Temporary anchorage may be had to the eastward of Bella Bella islands off a green bushy flat.

KLIK TSO ATLI HARBOUR, on the north side of Denny island, and $1\frac{1}{2}$ miles east of Bella Bella islands, is about one mile in extent, with depths of 9 to 13 fathoms, and affords excellent shelter for vessels of any size. Harbour island, off the north-west point of Klik tso atli, has a reef extending one cable from its east end.

Steamer passage.—The channel south of Harbour island is one cable wide, with a depth of 7 fathoms, and is suitable for small vessels; large vessels are recommended to pass north of Harbour island and through Wheelock pass, which lies between a 3-fathoms patch near the centre of the channel and Noble point, the north-east entrance point of the harbour, from which a 3-fathoms shoal extends three-quarters of a cable in a south-westerly direction.

The west extreme of Cypress island in line with the east extreme of Meadow island bearing N.N.W. $\frac{3}{4}$ W., leads through Wheelock pass in 11 to 19 fathoms, and when Harbour island bears West anchor in 12 fathoms. There is secure anchorage in 15 fathoms, with Harbour island bearing S.S.E. $\frac{1}{4}$ E., distant 3 cables.

Ka koosh dish creek, just north of Noble point, and extending $1\frac{1}{4}$ miles in an easterly direction, is suitable for small craft, but is barred across by kelp, over $3\frac{1}{2}$ fathoms.

There is an Indian fishing station at the head of this creek.

Main passage, leading from Lama passage to Seaforth channel, between the north-east extreme of Campbell and Narrows islands, is three-quarters of a mile long N.N.E. and S.S.W., and from 2 to 2½ cables wide, with depths of 20 to 30 fathoms in it. Care should be taken to maintain a mid-channel course, and in thick weather much caution must be observed, as the tidal streams are very strong.

Narrows island, situated about three-quarters of a mile North of Bella Bella islands, is three-quarters of a mile long E.N.E. and W.S.W., and nearly half a mile broad; at one cable from the south side of Narrows island there is a ledge of rocks awash at high water, with 5 fathoms close to.

Pole and Tree islets, situated about a quarter of a mile from the east extreme of Narrows island, are two small islets 2 cables apart in a north and south direction from each other; Tree islet, the northernmost, is 120 feet high, with a detached rock close to its north-east side. There are two rocky ledges between these islets and Narrows island.

Hodges reef, which dries 2 feet at low water springs, with 6 and 7 fathoms close-to, lies nearly in mid-channel between Tree islet and Deer island, the latter lying 4 cables east from the former. From this reef the centre of Tree islet bears West distant 2 cables.

Meadow island, half a mile long N.E. and S.W., lies 2 cables S.E. of Pole islet. In the channel between them are depths of 5 to 15 fathoms, and a reef lies half a cable from the north point of Meadow island.

Deer and Cypress islands lie eastward of the above islands, and are joined at low water; the former is half a mile long in a N.W. and S.E. direction; the latter one mile long E.N.E. and W.S.W.

Gunboat passage, between Denny and Cunningham islands, is narrow and intricate, containing many rocks and kelp patches; in some places the channel is not more than half a cable wide. From its western entrance it trends about E. by N. for 6 miles, thence North for 2 miles to its eastern entrance, which is at the junction of Fisher and Dean channels.

Gunboat passage should not be attempted unless in small handy steam coasting vessels and with good local knowledge.

SEAFORTH CHANNEL, the main channel connecting Lama passage with Milbank sound, between Campbell island, and the Bardswell group on the south, and Chatfield, Yeo, and Don islands on the north, is 14 miles long E. by N. and W. by S. with an average breadth of one mile; the land on both sides is much broken by islands with channels between leading north and south; the water is generally deep, and with the Admiralty charts there should be no difficulty in navigating, in ordinary weather.

On the north side three arms branch off northward; Deer passage, the eastern, between Cunningham and Chatfield islands, is about 7 miles long, and communicates with Johnson channel; Return channel, the middle one, between Chatfield and Yeo islands, is about 3 miles in length and joins Bullock channel; and Spiller channel, the western, between Yeo and Don islands, extends 4 miles and connects with Ellerslie channel (*see* page 407). These channels have not been more than casually examined, and their entrances are fronted by innumerable small islands, rocks, and reefs. On the south side of Seaforth channel, at $9\frac{1}{2}$ miles eastward of Sound point, is Hecate channel, about 10 miles long in a general southerly direction, with an average width of one mile, and leads into Queen's sound.

Ormidale harbour, at the north extreme of Campbell island, is about one mile deep in a S.S.E. direction, and is protected from the north-east by Thorburne and Nevoy islands which lie across its entrance. The channel, nearly one mile S.W. $\frac{3}{4}$ S. from Grassy islet, lies westward of Nevoy island; it is about $1\frac{1}{2}$ cables wide, with from 14 to 16 fathoms water. Inside the water is deep, the depth over the greater part being from 15 to 20 fathoms. Steer in mid-channel, and anchorage may be had in 17 fathoms about 2 cables S.S.E. from Nevoy island.

The passage in is longer, but the berth is more convenient than in Kynumpt harbour directly west of it.

Kynumpt harbour, on the north point of Campbell island, immediately west of Ormidale harbour (south shore of Seaforth channel), and about 2 miles westward from its junction with Lama passage, may be recognised by Grassy islet, 20 feet high, and Regatta rock, both of which are conspicuous, lying in the middle of the channel $1\frac{1}{4}$ miles north-eastward of the harbour, and also by White stone, a conspicuous bare rock 12 feet high, lying 2 cables westward of the entrance.*

* *See* Admiralty plan :—Kynumpt harbour, on chart No. 1,901; scale, $m = 5.5$ inches.

The harbour, the entrance to which is between Shelf point and Low island, is 4 cables long N.N.W. and S.S.E., and averaging 2 cables in breadth with 6 to 16 fathoms, mud bottom; the best anchorage is in 7 to 9 fathoms with the north extreme of Berry point bearing E.N.E., and the west extreme of Low island N. by E. $\frac{1}{2}$ E. A rocky patch with 6 feet on it, lies on the western side of the harbour, with the south-east extreme of Low island bearing N.E. by E. $\frac{1}{4}$ E. distant $2\frac{1}{10}$ cables, and Shelf point N.N.W. $\frac{3}{4}$ W.

It is high water, full and change, in Kynumt harbour at 0h. 30m.; springs rise 14 feet, neaps 11 feet.

Grassy islet, small, 20 feet high, covered with long grass and bushes, and with two trees on it, lies nearly one mile N.E. by N. from the entrance to Ormidale harbour.

Regatta rock, awash at high water, one cable in extent north-east and south-west, lies half a mile W. by N. $\frac{1}{2}$ N. from Grassy island.

Dall patch, a shoal with less than 6 feet water on it, lies half a mile N.N.E. from the entrance to Kynumt harbour; from the centre of the patch Defeat point bears S. by W. $\frac{1}{4}$ W. distant 4 cables; it is marked by a spar buoy, coloured black and red in horizontal stripes in $2\frac{1}{2}$ fathoms on the south-east side of the shoalest spot of 5 feet. A shoal of 3 fathoms extends $1\frac{1}{4}$ cables westward of Dall patch.

To avoid Dall patch, it is recommended to keep the southern shore aboard, which in this vicinity may be approached to within $1\frac{1}{2}$ cables; or if wishing to go northward of the patch,—Grassy islet, in line with the south extreme of Handyside island bearing E. $\frac{3}{4}$ N., leads nearly midway between Dall patch and Regatta rock.

Dundivan inlet, on the north coast of Dufferin island, about 3 miles westward of Kynumt harbour, indents the coast about $1\frac{1}{4}$ miles in a south-east direction. It branches into several creeks, of which Lockhart and Rait are the largest, and there are several small islets just within the entrance. The water is inconveniently deep for anchorage.

The south shore of Seaforth channel, westward of Dundivan inlet, trends in nearly a straight line to Sound point, the south-west point of entrance. At $2\frac{1}{2}$ miles eastward of Sound point Gale creek branches

in a southerly direction, and is supposed to connect with Boddy creek from the south-east, thus separating Dufferin island from the remainder of the Bardswell group.

Edge reef, on which there is a depth of $4\frac{1}{2}$ fathoms, lies nearly 4 cables distant from the south shore, at 2 miles eastward of Sound point. Several patches lie between it and the shore.

Cod bank, on which the least depth found was 27 fathoms, sand, lies in the middle of the western entrance to Seaforth channel $1\frac{1}{2}$ miles N. by W. from Sound point; there are 58 fathoms on the south side, and 163 fathoms, rock, close-to on the north side of Cod bank.

Hyndman reefs, the outer of several islets and reefs lying on the western shore at the entrance to Spiller channel, are nearly in the middle of that channel, and has a small rock only 3 feet above water on its south end.

Berry creek.—The south shore of Don island is broken and rocky, and has numerous islets and rocks skirting it. Berry creek is nearly 2 miles long in a northerly direction, and as the water in it is deep, and the entrance blocked by small islets, it is useless as an anchorage.

Blair inlet, 3 miles westward of Berry creek, is another indentation, useless as an anchorage on account of the numerous rocks with which it is studded. Ivory and Watch islands form its south side.

Midge reefs, on the north side of Seaforth channel, cover at 10 feet rise, and extend 4 cables in a southerly direction from Bush point (Don island), and are $3\frac{3}{4}$ miles within the western entrance to the channel. Mark rock lies one cable distant from the south-east point of Don island, and one mile E.N.E. from Midge reefs; between them is Sunk reef. Bare rock, black and low, kept just open southward of Surf islet, bearing W. $\frac{1}{4}$ S., leads half a mile southward of Midge reefs, and the north shore of Seaforth channel should not be approached within this distance.

Mouse rock, on which the sea sometimes breaks, lies half a mile W.S.W. of Ivory island off the entrance to Blair inlet. Idol point kept open of Surf islet, bearing E. $\frac{1}{2}$ N. leads 2 cables south of Mouse rock.

CHAPTER XI.

INNER CHANNELS, MILBANK SOUND TO
CHATHAM SOUND.

VARIATION IN 1898.

Milbank sound, $25^{\circ} 30'$ E. | Chatham sound, $27^{\circ} 0'$ E.

MILBANK SOUND has its entrance between the parallels of $52^{\circ} 9'$ and $52^{\circ} 16'$ N. and the meridians of $128^{\circ} 33'$ and $128^{\circ} 42'$ W. This spacious sheet of water is the main opening from seaward leading to Scaforth, Finlayson, and Mathieson channels.*

At its entrance between cape Swain and Day point, the sound is nearly 9 miles wide, which breadth it maintains in a N.N.E. direction for 5 miles, thence it trends more northerly, and takes a N.N.W. direction for 10 miles, leading in that direction into Finlayson channel.

A run of deep water 8 miles broad, with depths of over 100 fathoms, mud, extends south-westward of Milbank sound. North-westward of this channel the depths decrease to 50 fathoms, and less, off the entrance to Laredo sound, with a bottom of fine sand. South-eastward the depths are 76 and 80 fathoms, with a bottom consisting of sand, mud, and rock at intervals.

In thick weather, therefore, or if overtaken by fog, when approaching Milbank sound from the south-westward, with average precautions, a vessel's position can be indicated by the deep sea lead.

Position.—Cape Swain is situated in latitude $52^{\circ} 8' 50''$ N., longitude $128^{\circ} 33' 30''$ W.

Landmarks.—Approaching Milbank sound from the south-westward, Helmet peak on Lake island is conspicuous. This remarkable peak is 1,032 feet high, and bears a striking resemblance to a helmet, with the sloping side towards the west.

* See Admiralty charts:—Cape Caution to port Simpson, northern and southern portions, No. 1,923 a and b; scale. $m = 0.25$ of an inch.

Stripe mountain, on the north side of Dowager island, at the entrance of Finlayson channel, is 2,020 feet high, pyramidal in shape, with a remarkable landslip down its south-west side, destitute of timber and soil, but otherwise wooded to its summit; at its base is a comparatively level space scantily covered with vegetation, which is remarkable in such a thickly timbered country.

Nearing the sound the low wooded shores of cape Swain, the south-west entrance point to the sound, will be recognised. The shore northward of it is much broken, and the tops of the trees are about 120 feet high.

Day point (south point of Price island), the north-west entrance point of Milbank sound, has a group of wooded islets, rocks awash at high water, and sunken rocks extending from it; the western island of the group (Outer island) being round, wooded, and conspicuous. The outer edge of these dangers lies $2\frac{1}{2}$ miles S.S.W. from Day point, and 8 cables S.E. $\frac{1}{2}$ S. from Outer island.

White rock (Ka mas ik), lying about 5 miles within the sound, is 50 feet high, and half a mile N. by E. from it, is a smaller rock (Bare rock) 6 feet above high water. Both rocks are conspicuous, as, lying well out in the sound, they show out against the dark background of pine and cedar, which line the shores of Milbank sound.*

From White rock, a rocky ridge (on which the sea sometimes breaks) extends half a mile to the south-westward; and a patch of 2 fathoms lies $2\frac{1}{2}$ cables East of the same rock.

Discovery rocks, situated off cape Swain, are two dangerous rocks lying 8 cables N. by E. and S. by W. from each other. The southern danger, over which the sea seldom breaks, lies one mile W. $\frac{1}{2}$ S. from cape Swain. The northern rock, which is usually indicated by breakers, lies N.W. $\frac{1}{4}$ W. distant $1\frac{1}{2}$ miles from cape Swain.

West rock, situated on the eastern shore of the sound, is of small extent, 8 feet above high water, and lies half a mile S.W. $\frac{1}{4}$ S. from Sound point.

Several patches which uncover at low water lie between Sound point and West rock.

Mouse rock (see p. 415) is a dangerous sunken rock on which the sea generally breaks, lying at the north-west entrance to Seaforth channel, 6 cables W. $\frac{1}{2}$ N from Surf islet.

* See chart, No. 2,449.

Bush point (north side of Seaforth channel) seen just open south of Surf islet, bearing E. by N. $\frac{1}{2}$ N. leads southward; and Helmer peak seen just open of the west extreme of Mary island, bearing N. $\frac{3}{4}$ E., leads westward of Mouse rock.

Vancouver rock, a dangerous rock which uncovers 12 feet at low water, and is steep-to on all sides (there being depths of 13 and 14 fathoms within one cable of the rock), lies 4 miles N.N.W. $\frac{1}{4}$ W. from White rock, and $1\frac{1}{2}$ miles N.W. by W. $\frac{1}{2}$ W. from Boulder head. When visible this rock presents the appearance of a large whale, and is conspicuous.

Cross point (south-east extreme of Lady island), in line with Boulder head, bearing E. $\frac{3}{4}$ S., leads 6 cables southward; and Low point seen just open westward of the North island group, bearing North, leads westward of Vancouver rock.

Cross ledge extends 8 cables southward of Cross point, and partially uncovers. There is a depth of 20 fathoms close southward of Cross ledge. Surf islet, bearing E. by S., leads southward of Cross ledge in mid-channel between Cross point and White rock.

Boulder ledge, of sunken rocks, with depths of $1\frac{1}{2}$ and 5 fathoms, extends 9 cables in a south-easterly direction from Boulder head. Boulder bank, with 18 fathoms, rock, lies 7 cables S.S.W. from Boulder head. Surf islet, bearing E. by S., leads southward of the dangers off Boulder head.

North ledges, which uncover at low water, lie northward of the North island group. The north extreme of these ledges lies 6 cables N. by W. $\frac{1}{2}$ W. from North island; and the south extreme 2 cables N.E. of that island.

Sandstone reef, situated close to the shore in the north-western portion of Milbank sound, is a conspicuous narrow ridge, of sandstone formation, about one mile long in an E. by N. and W. by S. direction. The highest portion of this ridge is 4 feet above high water.

The western extreme of Sandstone reef lies 5 cables from the shore of Swindle island, and $1\frac{1}{2}$ miles from the eastern side of Price island.

PRICE ISLAND, forming the western shore of Milbank sound, has a conspicuous ridge of hills (Jocelyn range) along its eastern

shore, from 300 to 600 feet in height. From Day point the eastern coast of Price island trends in a N. by E. direction for 4 miles to Aldrich point, and is much broken into small exposed bays.

Boat cove, which affords shelter to boats, is situated half a mile northward of Aldrich point. With this exception the coast of Price island, north of Aldrich point, is almost straight and unbroken for 8 miles, in a N.N.W. $\frac{1}{2}$ W. direction to the entrance of Schooner passage.

The eastern shores of Milbank sound are comparatively low and wooded, with pine and cedar trees predominating. In that portion of the sound lie two extensive channels (Mathieson channel and Moss passage), which branch from Milbank sound eastward and northward of Lady island, respectively. Lady island is low and wooded throughout. The western shores of Dowager island are also low and wooded, but are flanked by high mountains.

The south-east extreme of an island contiguous to Lady island, terminates in a high bold cliff (Boulder head). Cliff island which lies off the south-west side of Dowager island at the entrance to Moss passage is small, 225 feet high, and its south-east extreme terminates in high, conspicuous white cliffs.

North island is rocky, about 150 feet high, with some stunted trees growing on its summit.

Low point, the western extreme of Dowager island, and the south-east entrance point of Finlayson channel, is low and wooded.

Directions.—Approaching Milbank sound from the south-westward in clear weather, Helmet peak should be kept in line with White rock, bearing N.N.E. $\frac{3}{4}$ E., which mark will lead nearly in mid-channel up the sound. When within $2\frac{1}{2}$ miles of White rock, on that line, a vessel bound eastward may steer towards Seaforth channel, or if bound northward a N. by W. course may be steered towards Finlayson channel.

In thick weather, with average precautions and attention to the deep sea lead, the soundings will indicate the vessel's position.

Bound from Seaforth channel into Finlayson channel, keep Idol point well open southward of Surf islet, bearing E. $\frac{1}{2}$ N., until Helmet peak comes open of the west extreme of Mary island, bearing

See chart No. 1,923b.

N. $\frac{3}{4}$ E., and then Surf islet should be kept astern bearing E. by S. for 3 miles, which will lead in mid-channel, $1\frac{1}{2}$ miles northward of White rock. From this position Cliff island should be seen open westward of Boulder head, bearing N.N.W. $\frac{1}{2}$ W., and a vessel may steer N.W. by W. $\frac{1}{2}$ W. for 3 miles, or until Low point is seen open westward of the North island group bearing North; thence steer N.N.W. for 3 miles, or until Stripe mountain bears N.E. by N., when it may be steered for on that bearing, and the course gradually altered northward into Finlayson channel.

Tides and tidal streams.—The flood stream sets to the northward, and divides near the middle of Milbank sound, one portion running towards Finlayson channel, another towards Mathieson channel, and another towards Seaforth channel. The reverse takes place on the ebb.

The strength of tide is variable, but it seldom exceeds one knot an hour in Milbank sound, but increases within the channels to 2 and 3 knots an hour.

MATHIESON CHANNEL is an extensive arm of the sea leading many miles northward from Milbank sound, eastward of Lady and Dowager islands, with depths of 103 and 105 fathoms in mid-channel. At $2\frac{1}{2}$ miles within its south entrance this channel is obstructed by islands, islets, and rocks, and a stranger should, therefore, not attempt to proceed further. From the east entrance to Oscar passage, by which it communicates with Finlayson channel (*see* page 424), Mathieson channel extends in a N.N.W. direction along the east side of Roderick island for over 25 miles to its junction with Mussel inlet; one arm, about 5 miles long, branching eastward at about 5 miles south of the junction; it has not been surveyed.

ST. JOHN HARBOUR (*Cheek squintz*) is on the south-east shore of Milbank sound, nearly midway between cape Swain and Sound point, and, though somewhat confined, affords good anchorage for small vessels.

The harbour is protected at its entrance by a reef awash and sunken rocks, which form a natural breakwater. Eastward of this reef, at the entrance, there is a clear channel, 2 cables wide, with depths of 10 to 30 fathoms.

At 5 cables within the entrance are two small islands, Wood island, the eastern and smaller one, being round, wooded and conspicuous. The channel eastward of these islands is barely one cable

wide abreast Wood island, and leads into Anchor bay, which is the usual anchorage for small vessels. Westward of these islands the channel is wider and leads into Deep bay, which forms the southwest arm of St. John harbour.

There are depths of 9 to 20 fathoms in Deep bay, and 11 to 14 fathoms in Anchor bay.

Rage reef extends 7 cables northward from the west point of St. John harbour, and is about 2 cables wide. This dangerous reef consists of ledges which uncover, and rocks awash at high water; the northern extreme uncovering 4 feet at low water. Mark islet, 6 feet above high water, lies about midway on the eastern side of Rage reef.

Ledges, which uncover, extend one cable from the eastern shore of the channel leading into the harbour.

Directions.—Approaching St. John harbour, cape Swain should be kept well open of the conspicuous quoin-shaped point situated 2 miles northward of the cape, bearing S. $\frac{1}{2}$ W. On no account should Rage reef be approached inside that line, until Wood island (within the harbour) is distinctly seen, and North point bears East. When Wood island is recognised, it should be brought to bear S.S.E. $\frac{1}{2}$ E., and steered for. Wood island on that bearing should be seen in line with a black high-water rock on the south shore of Anchor bay, with a sandy bay immediately east of the rock.

Caution.—At high water, when Rage reef is nearly covered, it is difficult to distinguish the entrance into St. John harbour. At half-tide, and at low water, the northern end of that reef and also the dangers on the eastern side of the channel are visible, and a vessel can be guided clear of them by the eye. That period of the tide is, therefore, the best time for entering St. John harbour.

PORT BLAKENEY, formed between Mary and Don islands, on the south side of Mathieson channel, about 3 miles within the entrance, is easy of access, and lies immediately at the head of Milbank sound. At its entrance, between Promise and Rain points, the port is $2\frac{1}{2}$ cables wide; thence it takes a southerly direction for about one mile, terminating in a small creek leading into Seaforth channel.*

Od reefs are a cluster of rocks awash, and sunken rocks, about $2\frac{1}{2}$ cables in extent in a north and south direction at the entrance to

* See Admiralty plan:—Port Blakeney, on sheet of plans, No. 1,462; scale, $m = 3$ inches.

port Blakeney. The southern rock of this cluster is 4 feet above high water, and the northern rock, with 24 feet water over it, lies 3 cables N.N.E. from Promise point, with a clear channel northward of it $1\frac{1}{2}$ cables wide.

Oke reefs, situated about 2 cables northward of Cod reefs, extend 2 cables from the south side of Oke island. The outer detached rock is 3 feet above high water, and between it and Oke island several patches of rock uncover at high water.

White rocks off the south end of Lake island, seen in line with the north end of Passage island (between Lake and Lady islands) bearing W. $\frac{1}{2}$ N., will lead between Oke and Cod reefs. Mark islet, seen in line with Oke island, bearing N.W. by N., will lead eastward of those dangers.

Sand patch, with 24 feet water upon it, is of small extent, and lies nearly in mid-channel about 5 cables within port Blakeney. Helmet peak, seen in line with Promise point, bearing N. by W. $\frac{1}{2}$ W., will lead westward of Sand patch.

Anchorage in 10 to 12 fathoms, sandy bottom, will be found about 5 cables within port Blakeney, with Helmet peak seen just open of Promise point bearing N. by W. $\frac{1}{2}$ W., and Observation point on the north shore of East bay bearing E. by N. $\frac{1}{2}$ N.

Tides.—It is high water at full and change, in port Blakeney, at noon; springs rise 13 feet, neaps 8 feet.

Supplies.—Wood and water may be obtained in port Blakeney. Rock cod and other fish may be caught in abundance on Cod reefs, and clams and cockles gathered in the sandy bays; they are readily obtained at low water by digging in the mud and sandy ground, especially in those places over which a fresh-water stream runs. Wild fowl are also plentiful in the season.

Directions.—Approaching port Blakeney from the southward, Helmet peak should be kept just open of the eastern point of Lady island (Lang point) bearing N. by E. $\frac{1}{2}$ E., and when within 5 cables from the latter a N.E. $\frac{1}{2}$ N. course should be steered towards Oke island, until White rocks are in line with the north end of Passage island bearing W. $\frac{1}{2}$ N., and when Mark and Oke islands are seen in line bearing N.W. by N. a vessel will be eastward of Cod reefs, and may then haul into the harbour.

MOSS PASSAGE (Too witl) leads northward of Lady island from Milbank sound into Mathieson channel. At its western entrance this passage is over one mile wide; but at 3 miles within this entrance, and one mile from its junction with Mathieson channel, it is contracted by Squaw island to barely one cable named Sloop narrows. Beyond that position, therefore, it should not be attempted by a stranger.

Bird rock, at the western entrance of Moss passage, 3 cables E. by S. from the south extreme of Cliff island, is 3 feet above high water with foul ground extending 2 cables eastward from it. The south extreme of the North island group seen just open southward of the south extreme of Cliff island, bearing W. by N. $\frac{1}{2}$ N., leads southward of Bird rock.

MORRIS BAY, situated on the south side of Moss passage, about one mile within its western entrance, is $2\frac{1}{2}$ cables wide, and extends in a south-easterly direction for 3 cables, terminating in a flat which dries at low water. Westerly winds send a swell into the anchorage; but the bay possesses the great advantage of permitting the state of the weather in Milbank sound being ascertained when at anchor, and if fog be prevalent (as is often the case) it can be seen from Morris bay.*

Kitty patch lies at the eastern entrance to Morris bay, one cable from the eastern shore. This bank is one cable in extent north and south, with depths of 4 and 5 fathoms, sand.

Directions.—Approaching Morris bay, a mid-channel course should be kept between Bird rock and Salal point; and if Vancouver rock be uncovered, it should be kept bearing S.W. by W. (westerly). When the south extreme of Cliff island is seen open northward of Bird rock, bearing W. $\frac{1}{2}$ N., that mark kept on will lead to the entrance to Morris bay.

Anchorage will be found in 12 to 14 fathoms, sandy bottom, at one cable from the western shore, with the western entrance point of Morris bay, bearing W. by S. $\frac{1}{2}$ S., and Detached island (north side of Moss passage) bearing N.N.W.

Supplies.—Good water may be obtained in Morris bay. Clams and cockles can be gathered in abundance. Plover and other birds frequent Bird rock. Berries grow in abundance on Salal point.

See chart, No. 1,923b.

* See plan of Morris bay on Admiralty chart, No. 1,462; scale, $m = 4\frac{1}{2}$ inches.

ALEXANDRA PASSAGE lies eastward of Vancouver rock and North island group. Small steam-vessels, possessing local knowledge, make use of Alexandra passage, especially when coming from the northward to anchor in Morris bay; but this passage is barely 6 cables wide in its narrowest part, and in the event of an accident to the machinery a vessel using it would be in a dangerous position.

Cliff island (*see* p. 419) is nearly steep-to, but the small islet close northward of it has foul ground extending from it one cable westward.

Directions.—If compelled by circumstances to make use of Alexandra passage keep the western shore of Finlayson channel north of Jorkins point in line with Low point, bearing N. by W. $\frac{1}{4}$ W., which is the general leading mark through this passage. It is, however, recommended alternately to open and close these points, especially when nearing North island group, so as to keep in mid-channel.

SCHOONER PASSAGE, leading from Laredo sound into the north-west corner of Milbank sound, is obstructed by islands, islets, rocks, and sunken dangers, and no specific directions can be given for it. It is occasionally, however, made use of by small coasting craft, and the large canoes of the Queen Charlotte islanders also pass through it when making the passage to Vancouver island.

FINLAYSON CHANNEL, the entrance to which is between Jorkins and Low points, extends from Milbank sound in a northerly direction for 3 miles, and thence in a general direction N.N.W. $\frac{1}{4}$ W. (westerly) for 18 miles, and thence N. $\frac{1}{2}$ E. for 6 miles to the head of Carter bay, with an average width of one to 2 miles. The land on both sides is from 1,000 to 3,000 feet high, the peaks closely approaching the shores and rising in a precipitous manner from the water's edge. Unless where the vegetation has been denuded from the mountain sides by landslips, both shores are thickly wooded, the pine and cedar predominating; occasionally their dark green foliage is relieved by the bright light green leaf of the maple.

Oscar passage, $4\frac{1}{2}$ miles north of Low point, leads eastward out of Finlayson channel, between Dowager and Roderick islands, and is about one mile wide, and 6 miles long to its junction with Mathieson channel.

Bulley bay, situated on the south shore of Oscar passage, $3\frac{1}{2}$ miles within its western entrance, though small, affords temporary anchorage in 15 fathoms, at one cable from the shore, and is occasionally used by coasting vessels.

The Sisters, two small islets, lying 2 cables from the eastern shore of Finlayson channel, $3\frac{1}{2}$ miles northward of Oscar passage, are wooded and about 90 feet high. They lie north-west and south-east 4 cables from each other, and are joined by ledges which uncover at low water.

NOWISH (Otter cove) lies 5 cables northward of the Sisters islets, between Indian and Susan islands. The entrance, northward of Indian island, is 2 cables wide; the cove then extends E.S.E. for 5 cables, narrowing near its head, to one cable wide, and having on its north shore, about 4 cables within the cove, a small bay, which affords anchorage for small vessels in 10 to 14 fathoms, sandy bottom, in the middle of the bay.*

Tides.—It is high water, full and change, in Nowish cove, at noon; springs rise 12 feet.

Jackson passage, an unexplored arm of the eastern shore of the channel, is 2 cables wide, and extends in an easterly direction from its entrance.

Mary cove, situated on the eastern shore, $5\frac{1}{2}$ miles northward of the Sisters islets, is barely one cable wide at its entrance, and extends in a northerly direction for 5 cables, terminating in a sandy beach. There are depths of 24 and 7 fathoms in mid-channel within this cove.

CONE ISLAND, on the western shore of Finlayson channel, is $3\frac{1}{2}$ miles long in a N.W. $\frac{1}{2}$ N. and S.E. $\frac{1}{2}$ S. direction, and about 5 cables broad. The summit of this island, Bell peak, situated about one mile from its south extreme, is conical in shape, 1,280 feet high; the eastern and western sides are precipitous; but the land slopes gently to the northward terminating in Wedge point.*

KLEMTOO PASSAGE, between Cone and Swindle islands, is about $3\frac{1}{2}$ miles long in a north-west and south-east direction, and in some parts barely one cable wide. Its southern entrance, one cable

* See Admiralty plan:—Nowish cove, on sheet of plans. No. 1,462; scale, $m = 4$ inches.

wide, extends in a N.W. $\frac{1}{4}$ W. direction for about one mile; thence in a general direction N.W. $\frac{3}{4}$ N. for $2\frac{1}{2}$ miles, to abreast the north extreme of Jane island. The depths in mid-channel are from 10 to 30 fathoms, sand and shells, with rock at intervals. Though narrow, this passage is safe (provided a mid-channel course be kept), and affords anchorage almost throughout.*

Anchorage, suitable to vessels of moderate length, will be found north of Star islet, nearly in mid-channel, one cable from the shore of Cone island, at $1\frac{1}{2}$ miles within the eastern entrance, in 12 fathoms sand and shells.

Tides and tidal streams. --It is high water, full and change, in Klemtoo passage, at noon; springs rise 13 feet, neaps 8 feet, and the neaps range 3 feet. The tidal streams are comparatively weak. The flood or north-going stream is but little felt, the great body of water passing into Finlayson channel. The ebb seldom exceeds the rate of one mile an hour.

South passage, between Cone and Jane islands, is 5 cables wide, with depths of 18 to 37 fathoms, rock.

Kelp patch, with 5 to 12 feet over it, lies one cable southward of Jane island, and is about one cable in extent in a south-east and north-west direction.

Berry point (east side of Swindle island), seen just open of Legge point (west side of Cone island) bearing S.S.E. $\frac{3}{4}$ E., will lead southward and westward of Kelp patch.

Wedge rock uncovers at low water, and lies 50 yards from the north extreme of Cone island. Ripple bank, with 11 fathoms, rocky bottom, lies nearly in mid-channel of South passage.

North passage, between Jane and Sarah islands, is 5 cables wide, with depths from 22 fathoms to no bottom at 38 fathoms.

Danger patch, with one to 3 fathoms water over it, lies one cable north-westward of Jane island.

JANE ISLAND, situated 5 cables north-west of Cone island, is about one mile long in a N.W. and S.E. direction, and 5 cables broad. It is low and wooded, the tops of the trees being 200 feet high.

See chart, No. 1,923b.

* &c Admiralty plan:—Klemtoo passage and anchorage, on sheet of plans No. 1,462; scale, $m = 4$ inches.

Sarah island, the south point of which is 6 cables northward of Jane island, is 15 miles long in a N.N.W. and S.S.E. direction, and one mile to $2\frac{1}{2}$ miles broad. This island reaches its greatest elevation of 2,000 feet at 4 miles from its south extreme. On the south-east side of the island, at 7 miles from the south extreme, an unexplored bay faces south-eastward, and at $3\frac{1}{2}$ miles from the south extreme of Sarah island, on its eastern shore, there are two high waterfalls.

Watson bay lies on the eastern side of Finlayson channel, 9 miles northward of Sisters islets. This unexplored bay is one mile wide at its entrance, and extends in an easterly direction.

Wallace bight lies 2½ miles northward of Watson bay. It is one mile wide at its entrance, and takes a northerly direction for one mile. There is no bottom at 106 fathoms, between its entrance points.

Goat cove, situated 4 miles northward of Wallace bight, is 5 cables wide, and extends in an easterly direction for 5 cables, terminating in a sandy beach. There are depths of 23 to 34 fathoms within this cove, the former being close to the head.

Sheep passage is nearly one mile wide, and leads eastward from Finlayson channel, just south of Carter bay. At 3 miles within its western entrance, it trends northward until its junction with Mussel inlet.

MUSSEL INLET, which has not been explored since Vancouver's visit in 1793, takes a N.N.W. direction for about 5 miles, when it suddenly turns to the eastward for about the same distance, terminating in Poison cove, so named by Vancouver, owing to several of the crew of the *Discovery* being poisoned by eating mussels found there. It is stated to have the same general characteristics as the other inlets.

CARTER BAY.—This excellent stopping place lies at the head of Finlayson channel, 26 miles within its entrance, and is easily recognised by the high cliffs on its western shore. The bay is 4 cables wide at its entrance, abreast the anchorage ground, and about 6 cables deep in a northerly direction, the head terminating in a large stream fronted by an extensive flat.*

See chart, No. 1,923b.

* *See* Admiralty plan :—Carter bay, on sheet of plans, No. 1,901; scale, $m = 4$ inches.

Anchorage will be found in 14 to 15 fathoms, mud bottom, at $1\frac{1}{2}$ cables from the eastern shore, and 2 cables from the sand flat at the head of the bay; with the entrance points of the bay bearing S.E. $\frac{1}{4}$ S. and S.S.W. $\frac{1}{4}$ W. respectively.

Supplies.—Water can be obtained from the large stream at the head of the bay, which is probably one of the best watering places along the coast. Trout abound in the fresh-water stream. Tracks of bear and deer were seen on the shore. Wild fowl frequent Carter bay.

Caution.—Shell fish, of whatever kind, should not be eaten.

Tides.—It is high water, full and change, in Carter bay at noon; springs rise 13 feet.

HIE KISH NARROWS lie northward of Sarah island, and lead from Finlayson channel into Graham reach. This channel is about $5\frac{1}{2}$ miles long, in a general N.W. and S.E. direction, and from $2\frac{1}{2}$ cables to one mile wide. The depths are 31 to 73 fathoms in mid-channel, over a bottom of sand and shells.

Hewitt rock, a dangerous sunken rock with 10 feet over it, and deep water close to, lies at the western entrance of Hie Kish narrows nearly in mid-channel. A black can buoy marks this rock.

The north shore of the channel should be kept aboard when navigating the western portion of Hie Kish narrows. The south point of Carter bay, seen just open of the north extreme of Sarah island, bearing S.E. $\frac{3}{4}$ E., leads northward of Hewitt rock.

TOLMIE CHANNEL, situated between Princess Royal and Sarah islands, is about 15 miles long in a general N.N.W. and S.S.E. direction, and from a half to one mile wide.

On the west shore, $2\frac{1}{2}$ miles northward of south point of Sarah island, an extensive arm takes a southerly direction, and is reported to communicate with Laredo sound. Abreast the north-eastern point of this inlet, a small islet lies close to the shore of Sarah island.

Caution.—The northern reach of Tolmie channel looks directly into this inlet, care is therefore necessary when approaching from the northward not to mistake this unexplored arm for the reach leading to Klemtoo passage.

At 2 miles northward of the above-mentioned inlet, on the west shore of Tolmie channel, lies another unexplored passage, facing the south-east.

Tolmie rock, on which is 4 feet water, lies 100 yards from the shore of Sarah island, at 5 cables within the northern entrance of the Tolmie channel.

Directions.—Tolmie channel, though not so wide as Finlayson channel, is preferable in some respects, especially if compelled to be under way at night. A mid-channel course should be steered throughout except when navigating the northern part of the channel, when the west shore should be neared to avoid Tolmie rock.

Tidal streams.—The flood stream sets to the northward, and is stronger in Finlayson than in Tolmie channel. The ebb, however, is stronger in Tolmie channel, and runs for $1\frac{1}{2}$ hours after the ebb has ceased in Finlayson channel. In the narrow parts of these channels, both flood and ebb streams attain a velocity of 3 knots an hour at springs.

GRAHAM REACH, situated northward of the junction of Tolmie channel with Hie Kish narrows, is about 17 miles long, in a general N.W. by N. and S.E. by S. direction, and from a half to one mile broad, with depths of from 38 fathoms, rock, to 150 fathoms, sand and shells. From the north-west extreme of Sarah island this reach takes a N.W. by N. (northerly) direction for 7 miles, to abreast Swanson bay, thence it takes a N.W. $\frac{1}{4}$ N. direction for $10\frac{1}{2}$ miles to abreast Red cliff point. In general features this reach resembles Finlayson channel.*

Green inlet lies on the north shore, 2 miles northward of Sarah island. This unexplored arm takes an easterly direction at its entrance.

Flat point lies on the west shore, 3 miles westward of Green inlet. This point is wooded, flat, and comparatively low. Abreast Flat point, on the south shore of the channel, is a remarkable large boulder rock.

SWANSON BAY lies on the north shore, 7 miles from Sarah island. There is a conspicuous waterfall on the south shore of the channel abreast Swanson bay; in very dry summers this is reduced to a very small size, and even occasionally ceases altogether.

Anchorage may be obtained in 19 fathoms, sandy bottom, in the northern part of Swanson bay, with the conspicuous waterfall on the south shore shut in with the north entrance point, and Flat point shut in with the south entrance point of the bay.

Khutze is an unexplored arm, on the north shore, 6 miles westward of Swanson bay. It is 5 cables wide, and lies in a N.E. by E. direction from its entrance. Anchorage is reported by Indians at the head of this inlet.

Aaltanhash is another inlet on the north shore, unexamined by the Admiralty Survey, 2 miles westward of Khutze. In size and direction it is similar to Khutze, and is reported by Indians to afford anchorage.

Tidal streams.—The tidal streams meet abreast Aaltanhash inlet.

Red cliff point, the turning point into Fraser reach, lies on the south shore, $17\frac{1}{2}$ miles from Sarah island. This point terminates in a conspicuous cliff of a reddish brown colour; and is a good landmark.

FRASER REACH, the channel north-westward of Graham reach, is $12\frac{1}{2}$ miles long in a general W. by N. and E. by S. direction, and a half to $1\frac{1}{2}$ miles wide. In features it resembles Finlayson channel.

Warke island is $1\frac{1}{2}$ miles long in an east and west direction, and half a mile broad. The east extreme of this island lies one mile W.N.W. from Red cliff point. The channel on both sides of the island is deep, but that to the south is slightly the wider. There is a bay on the south shore of the channel, abreast Warke island, at the head of which is a fine trout stream, communicating with a large lake. Fraser reach from abreast Warke island takes a W. by N. direction for 5 miles, thence W.N.W. for 6 miles to abreast Kingcome point.

Klekane, an unexamined arm on the north shore, abreast Warke island, is 5 cables wide, and takes a N.W. direction from its entrance. Approaching from the south-eastward this arm appears as the continuation of Graham reach. Anchorage may, from Indian report, be obtained at the head of Klekane inlet.

Kingcome point, the turning point into McKay reach, is on the south shore 12 miles from Red cliff point. The point is long, sharp, and conspicuous.

McKAY REACH leads westward from Fraser reach into Wright sound, is about 8 miles long in a general W.S.W. and E.N.E. direction, and from one mile to 2 miles wide: there is no bottom in mid-channel at 139 and 225 fathoms, the latter at 2 cables southward of Cumming point.

From mid-channel abreast Kingcome point, the reach takes a W.S.W. direction for 4 miles to abreast Trivet point: thence S.W. by W. for 4 miles to abreast Cumming point. Westward of Kingcome point, a deep bay lies on the south shore, between Kingcome and Trivet points.

The land on the north shore of the channel is high and bold, with mountains 3,000 feet high. The land on the south shore is not so high; and near the summits of the mountains are some extensive bare patches of slate colour.

GRIBBELL ISLAND, the shores of which have not been surveyed in detail, is of somewhat rectangular form, about 11 miles long (north and south), and 7 miles wide. The Wimbledon mountains, along its south shore, are from 2,000 to 3,000 feet high.

Ursula channel.—Between Pilot point, the south-east point of Gribbell island, and Fisherman cove, on the opposite shore, is the entrance to Ursula channel which skirts the east side of Gribbell island for about 7 miles. Its shores are composed of steep lofty mountains rising abruptly from the sea, and covered with pines and forest trees.

Fisherman cove, on the east shore at the entrance to Ursula channel, affords indifferent anchorage in 30 fathoms, with the south point of the bay (a clump which is connected to the shore by a sandy neck covered at high water) bearing S. $\frac{1}{2}$ W. When anchoring here feel the way with the deep sea lead, as the water shoals very suddenly from 30 fathoms to 12 fathoms, the latter depth being at about 25 yards from the shore. A small stream flows into the head of the cove, off which a shoal extends some distance, its edge being very steep.

At $2\frac{1}{2}$ miles northward from Fisherman cove is a small inlet where a hot spring was discovered. The colour and taste of which resembled the waters at Cheltenham.

Boxer reach, the continuation of Ursula channel W.N.W. along the north-east and north sides of Gribbell island, is about 6 miles long. On its north shore anchorage may be found in the north-west part of Bishop cove; this is a very good anchorage, and is formed by a narrow neck of sand extending from the land terminated by a clump covered with trees, similar to that at Fisherman cove. The water shoals gradually up to the sandy neck and a vessel might go into 15 fathoms.

There appears to be anchorage on the south-east side of the sandy neck, but the beach runs out shoal a long way on that side.

Verney passage, along the west coast of Gribbell island, takes a northerly direction from Money island, off its west entrance point, for about 8 miles, and communicates with Boxer reach; its shores have not been surveyed.

Devastation channel.—From the junction of Verney passage and Boxer reach at the north point of Gribbell island, the channel continues northward along the east side of Hawkesbury island for 20 miles; its shores have not been surveyed.

Gardner channel, the entrance to which is on the east side of Devastation channel, about mid-way along it, turns off at Staniforth point to the eastward, in which direction it continues, with many sinuosities, for upwards of 45 miles. "The land is an entirely barren waste, nearly destitute of wood and verdure, appearing as a mass of almost naked rocks rising to rugged mountains whose towering summits appearing to overhang their bases give them a tremendous appearance, covered with perpetual ice and snow."

Its shores have not been surveyed in detail, but there is reported to be anchorage on either side of Richardson point, on the south shore (south-east of Channel island), about 6 miles from the entrance, in from 18 to 5 fathoms; and also at Kemano bay on the north shore, 20 miles further up, but here the anchorage is said to be indifferent, as the water is deep and shoals very rapidly from no bottom at 25 fathoms to 3 fathoms; great caution is required in picking up a berth, and when entering keep over towards the eastern entrance

point (Entrance bluff), as shoal water extends for some distance from the opposite point.

Kemano river flows through an extensive valley into the head of Kemano bay, and is a stream of some size, navigable in the summer by canoes for a distance of 8 miles from its mouth. Kemano bay is frequented by the Kitlup Indians during the houlcan fishing season; their village, however, is at the head of the inlet. Bears are reported to be abundant in the Kemano valley, and mountain sheep in the mountains, but a scarcity of deer. Firewood can be obtained from the Indians at a moderate price.

In the winter months ice forms at 25 miles from the head of Gardner channel.

Tides.—It is said to be high water, at full and change, in Kemano bay at 1 hr. p.m. (June); springs rise about 9 feet.

Kitimat arm.—From the north end of Hawkesbury island the inlet continues in a northerly direction for a further distance of about 17 miles to about lat. $54^{\circ} 2' N.$, where it is terminated by a border of low land with a shallow flat extending from side to side, through which a small rivulet discharges itself at the eastern corner, navigable only for canoes. This termination differs in some respects from many of the others; its shores are not very abrupt but are bounded on each side by a range of lofty mountains, which, however, are not (as is constantly the case) connected at the head of the arm, but continue apparently in a direction parallel to each other. The valley between them, which is 3 or 4 miles wide, being covered with trees, mostly of the pine tribe. Two Indian villages of the Kitimat tribe are situated near the head of this arm.

Olio bay, on the east shore of the Kitimat arm, has been visited on several occasions by H.M. ships for the purpose of communicating with the Kitimat Indians, and affords anchorage in 17 fathoms.

Kildala arm extends in an E.N.E. direction for about 10 miles, branching off from the east side of Kitimat arm at about 11 miles from its head.

Douglas channel, which extends along the west shore of Hawkesbury island for upwards of 25 miles in a northerly direction, leading into the Kitimat arm at its junction with Devastation channel, has not been surveyed. It is about 3 miles broad, and the shores are

See chart, No. 1,923a.

very high. Kit kia tah, an unexplored inlet, branches from the west side of Douglas channel in a south-westerly direction at 6 miles from Money point, its south east entrance point. Small vessels may anchor in 5 fathoms half a mile within Kit kia tah inlet.

WRIGHT SOUND, a sheet of water 9 miles long in an east and west direction, and $2\frac{1}{2}$ miles wide at its narrowest part, lies between Gribbell and Gil islands, with no bottom at 119 and 220 fathoms.

It communicates eastward with McKay reach, and westward with Grenville channel.

Gil island, on the south side of the sound, culminates in a well defined snow-clad peak 3,000 feet high. (*See* page 482.)

The mountains north-eastward of Holmes bay have bare patches down their sides.

Directions.—In thick weather, when the shores are almost obscured to the water's edge, Wright sound, with its different openings north and south, makes a very perplexing picture to a stranger. Under such circumstances it is well to remember that a due West course leads across the sound from McKay reach to Grenville channel; the distance from point Cumming to Yolk point being just $7\frac{1}{2}$ miles.

Promise island, on the north side of the sound, with its two dome-shaped mountains, and cape Farewell, the south-east extreme of the island, are conspicuous.

HOLMES BAY (Quel ak se ax), situated on the eastern shore of Wright sound at the entrance of Whale channel, is 8 cables wide at its entrance, and recedes in an easterly direction for about 4 cables, terminating in a sand flat, which extends one cable from the head of the bay.*

The north entrance point is high and bold, and a small islet lies off the south entrance point of the bay.

Anchorage will be found in 14 fathoms, sand, with the south extreme of Promise island in line with the north point of the bay, bearing W. by N. $\frac{1}{2}$ N.; and Gil mountain in line with the south entrance point, S.W. by W.

See chart, No. 1,923a.

* *See* Admiralty plan :—Holmes bay, on sheet, No. 1,901; scale, $m = 5\frac{1}{2}$ inches.

Tides.—It is high water, full and change, in Holmes bay, in 1h.; springs rise 13 feet, neaps 10 feet.

Fisherman cove was the name given by Vancouver to an anchorage one mile eastward of Turtle point, close to the shore of Gil island. The water is deep, and the anchorage reported indifferent.

PROMISE ISLAND. at the south end of Douglas channel, is $3\frac{1}{2}$ miles long N.N.W. and S.S.E., with an extreme breadth of 2 miles; it is covered with pine and cedar, and culminates in two peaks of dome-shape, 1,680 and 1,710 feet high respectively. Cape Farewell, the south-east extreme of the island, terminates in a high, bold cliff. A conspicuous white cliff lies on the south shore, midway between cape Farewell and Thom point.

The east shore of the island is high, with an occasional bay with a sandy beach at its head. Dawson point, the north extreme, is low and wooded.

Farewell ledge uncovers at low water, and extends 2 cables south-east from cape Farewell. This ledge is steep-to, there being no bottom at 40 fathoms at 30 yards from it. Ledges extend one cable from the eastern shore of Promise island.

Dawson ledge extends 2 cables northward from Dawson point, and uncovers at half ebb.

COGHLAN ANCHORAGE, between the mainland and Promise island, situated about one mile westward of cape Farewell, is 3 cables wide at its entrance between Camp and Thom points, and extends in a north-west direction for 2 miles, widening within the entrance to 4 cables.*

Thom ledge extends 100 yards S.W. of Thom point.

Harbour rock is a dangerous rock of small extent, which uncovers 6 feet at low water, and lies nearly in mid-channel near the head of the harbour. This rock is steep-to, there being depths of 10 and 18 fathoms at 100 feet from the rock.

Gil mountain seen in line with Thom point, bearing S.E. $\frac{1}{4}$ E., will lead north-east; and Camp point seen just open of Observation point, bearing S.E. $\frac{1}{4}$ S., will lead westward of Harbour rock.

See chart. No. 1,923a

* *See Admiralty plan :—Coghlan anchorage, on sheet of plans, No. 2,189; scale, m = 3.25 inches.*

Otter shoal extends $1\frac{1}{2}$ cables from the western shore at the head of the anchorage, with depths of 3 fathoms and less upon it.

Anchorage in 6 to 7 fathoms sand, will be found near the head of Coghlan anchorage, with Gil mountain just shut in with Thom point, bearing S.E., and Stephens point just open of Letitia point (Stewart narrows) bearing N.E. by N. When entering keep in mid-channel, to avoid the ledge which uncovers off Thom point.

Stewart narrows lead northward of Promise island into Douglas channel. The streams in this passage are strong, and the channel confined; it is therefore not recommended.

Tides.—It is high water, full and change, in Coghlan anchorage at 0h. 30m.; springs rise 18 feet, neaps 14 feet.

Tidal streams.—The flood stream which enters Campania sound from the southward, divides off Passage island, and the main body of water passes up Squally channel. The lesser body, passing into Whale channel, skirts the north shore of Gil island, and unites, at one mile northward of Turtle point, with the main body of water which has entered Wright sound by Lewis passage. The flood stream from that position, sets directly across Wright sound, and impinging on Camp point causes very strong eddies off that point, and is then deflected towards Grenville channel.

A portion of the flood stream by Whale channel turns into McKay reach, and meets, abreast of Aaltanhash inlet, the flood stream from the Finlayson channel. Another portion proceeds into Douglas channel and Verney passage. On the ebb, the reverse takes place, the main body of water from Wright sound obtaining an exit by Whale channel.

The ebb streams from Wright sound, Douglas channel, and McKay reach, unite nearly midway between Maple point and Holmes bay, setting directly towards the latter, producing strong eddies at the mouth of Holmes bay. Thence the stream sets fairly through Whale channel, and passing north and south of Passage island, unites with the stream of Squally channel, and united they pass out into Campania sound.

Both flood and ebb streams attain the velocity of 3 knots an hour, at springs, in the contracted portions of the channels.

GRENVILLE CHANNEL leads north-westward out of Wright sound, and is the usual channel taken by steam-vessels when proceeding to the northern waters of British Columbia.

At its south-east end Grenville channel abreast Yolk point is 8 cables wide, thence it trends W. by N. $\frac{1}{2}$ N. for 4 miles to abreast Davenport point, with an average width of one mile. From this point the channel takes a W.N.W. direction for 11 miles, and narrows to 3 cables as Lowe inlet is approached, seldom exceeding 4 cables in width until north-westward of Evening point (Klewnuggit).

From a position in mid-channel westward of Lowe inlet, Grenville channel trends N.W. by W. $\frac{3}{4}$ W. for 7 miles, to abreast Evening point, thence it widens to one and 3 miles; and extends W.N.W. for 23 miles, to abreast Ogden channel. The depths in Grenville channel are 48 to 133 fathoms, rock.

The land on both sides is high, reaching an elevation of 3,500 feet on the north, and from 1,000 to 2,000 feet on the south shore; and for the most part is densely wooded with pine and cedar.

The mountains rise almost perpendicularly from the water, and cause the southern portion of this narrow channel to appear even narrower than it is (3 cables). But the general effect of so many mountains rising one behind the other, renders the Grenville passage one of the most beautiful landscapes on this coast; and is equalled only by Klemtoo passage.

The only directions necessary for navigating Grenville channel are to keep in mid-channel, except when passing Nabanhah bay, and then the south, or Pitt island, shore should be kept aboard. The south shore for 4 miles westward of Devonport point is stated to be foul, but close in.

Tidal streams in Grenville channel are weak, in most places not exceeding one knot; the flood stream from the northward meeting that from the southward abreast Nabanhah bay.

Morning reefs extend N.W. by W. nearly one mile from Evening point, and 5 cables from the north shore of Nabanhah bay. The south shore of Grenville channel must be kept on board when passing Morning reefs.*

Bare islet (north side of Klewnuggit inlet) kept open of Camp point (south side of that inlet) bearing N.E. $\frac{3}{4}$ E. will lead westward of Morning reefs.

LOWE INLET (Kumowadah), situated on the north shore of Grenville channel, about 14 miles from Wright sound, is a little over

* See Admiralty plan:—Klewnuggit. No. 2189; scale, $m = 3.25$ inches.

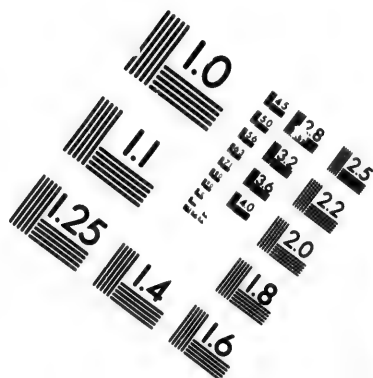
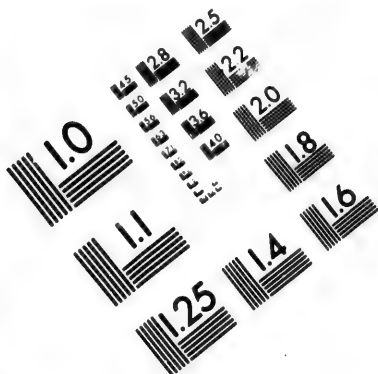
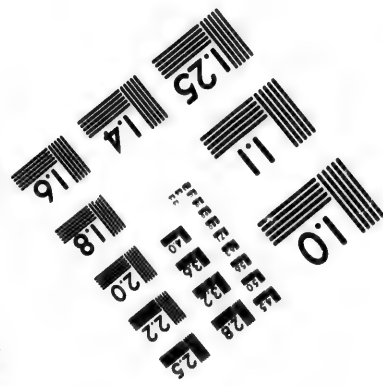
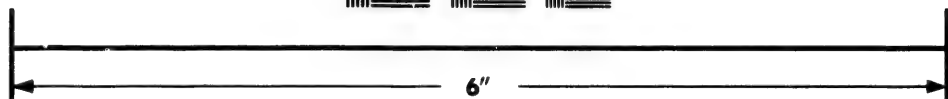
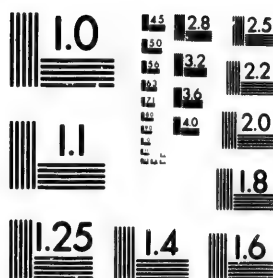


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2½ cables wide at its entrance between James and Hepburn points. From mid-channel, between the entrance points, the inlet extends in a N. by W. direction for 5 cables; thence N.N.E. for 6 cables to the mouth of Nettle basin, and widens to 4 cables.*

Nettle basin is nearly circular in shape, and is 5 cables across; but between its entrance points the basin is barely one cable wide. Within the general depths are 15 to 17 fathoms, mud.

In the north-east corner of the basin is a large stream, with a waterfall close to its mouth, and several others within (Verney falls). This stream is reported to be connected by a chain of lakes with Kit kia tah inlet (Douglas channel).

On the south side of the inlet a remarkable mountain, with a conical summit (Anchor cone), rises to the height of 2,010 feet.

High-water rocks, situated one cable from the western shore, at 4 cables within Lowe inlet, are awash at high water, and lie close to each other in a north and south direction. There is a depth of 23 fathoms, at 100 feet eastward of the rocks.

Don flat, with depths of 3 fathoms and less upon it, extends one cable from the head of the bay south of Don point, on the eastern shore.

Whiting bank, at 2 cables within the mouth of Lowe inlet, has depths of 10 fathoms and less on it extending across the entrance. Northward of that position the water deepens to 19 and 20 fathoms, mud.

Anchorage for vessels of moderate length will be found, in mid-channel, on Whiting bank, in 8 and 10 fathoms, sand and shells. In this position, Anchor cone mountain should bear E. by N.; and the eastern entrance point of the harbour (Hepburn point) S.E. by S. For a long vessel, more convenient anchorage will be found higher up the harbour, in mid-channel, in 20 fathoms, mud bottom, with Anchor cone mountain bearing S.E. by E.

Supplies.—Good water can be procured in Lowe inlet, from the stream in Nettle basin. Trout may be caught in that stream, and clams are found on the flat at the eastern shore of Nettle basin. Whiting, in abundance, may be caught on Whiting bank.

See chart, No. 1,923a.

* See Admiralty plan :—Lowe inlet, on sheet of plans, No. 2,189; scale, $m = 3.75$ inches.

Edible nettles grow on the shores of the basin, and are useful as an antiscorbutic when cooked.

Tides.—It is high water, full and change, in Lowe inlet at 0h. 30m.; springs rise 17 feet, neaps 15 feet.

KLEWNUGGIT INLET lies 9 miles westward of Lowe inlet, on the north shore of Grenville channel, and one mile westward of Evening point. The entrance between Camp point (south shore), and Leading island is 4 cables wide, and thence the inlet takes an easterly direction for 4 cables, and there divides; the longer arm (Exposed arm) extends in a south-easterly direction for 3 miles, and terminates in a swamp fronted by a sand flat. The shorter arm takes a north-west direction for $1\frac{1}{2}$ miles, passing northward of Leading island, and is $2\frac{1}{2}$ cables wide.*

Anchorage may be obtained in the North-west arm (Ship anchorage) in 15 to 20 fathoms, mud bottom, in mid-channel, at one cable from either shore.

Directions.—Entering Klewnuggit inlet, having cleared Morning reefs (*see* page 437), keep in mid-channel between Camp point and Leading island. Pass 2 cables S.E. of the latter, and anchor on its north side in Ship anchorage. In this position the south-east extreme of Leading island should be seen in line with a conspicuous cliff of purple colour, on the south shore of Exposed arm, bearing South.

Tides.—It is high water, full and change, in Klewnuggit anchorage at 0h. 30m.; springs rise 17 feet.

STUART ANCHORAGE, situated on the south shore of Grenville channel, $25\frac{1}{2}$ miles westward of Lowe islet, lies 5 cables westward of a long, low, wooded projection, which serves to distinguish it.†

Stag rock uncovers 13 feet at low water, and lies 4 cables W. by N. $\frac{1}{2}$ N. from the above-mentioned point. This rock has foul ground extending from it 4 cables in a W.N.W. direction, and a small patch, which uncovers at low water, lies one cable south from the rock.

* *See* Admiralty plan :—Klewnuggit inlet, on sheet of plans No. 2,189; scale $m = 3\cdot75$ inches.

† *See* Admiralty plan :—Stuart anchorage, on sheet of plans, No. 1,901; scale $m = 6$ inches.

The whole of this foul ground is indicated by kelp during summer and autumn.

Anchorage will be found in 10 to 15 fathoms, rock, 2 cables W. $\frac{3}{4}$ S. from Stag rock; with the south extreme of Gibson island seen touching the north side of Pitt island (Calvert point) bearing W.N.W. northerly.

Directions.—Proceeding for this anchorage, especially at high water, care is necessary. Pass 2 cables westward of the foul ground extending from the Stag rock, and anchor when at one cable to the southward.

Tides.—It is high water, full and change, at Stuart anchorage at 0h. 30m.; springs rise 17 feet.

The tidal streams meet abreast Evening point; eastward of that point the flood approaches from the eastward, and westward of the point from the westward.

At springs the flood stream in the narrow portions of Grenville channel attains the velocity of 2 knots, and the ebb 4 knots an hour. The latter stream continues to run for $1\frac{1}{2}$ hours after low water by the shore. Abreast Lowe inlet, strong eddies will be felt on the ebb.

False Stuart anchorage lies on the south shore 3 miles eastward of Stuart anchorage. On its north-west side there is a high, bold, projection. This point should serve to distinguish False Stuart anchorage from Stuart anchorage, as the latter has a long, low, projection on its south-east side. The water is deep, close to the shore.

Kxn geal, an unexplored inlet on the north shore, 5 cables westward of Evening point, is 5 cables wide at its entrance, and takes a north-west direction.

A rock which uncovers lies 2 cables south-east of the north-west entrance point of Kxn geal inlet.

At 6 miles W.N.W. from Kxn geal is Baker inlet with a narrow opening, but apparently quite extensive within, and in an easterly direction; a small islet or rock lies in the entrance. From this in a west and south-westerly direction nearly 3 miles is a narrow but deep opening, which from Grenville channel appears to cut Pitt island in two, and may join the eastern arm of Petrel channel.

Kum ea lon, an unexplored inlet on the north shore, abreast of False Stuart anchorage, has an entrance 2 cables wide, and takes a northerly direction. Some small islets lie near the north shore of Grenville channel westward of Kum ea lon inlet.

GIBSON ISLANDS, a group, situated in the western portion of Grenville channel, at its confluence with Ogden channel, consists, of an island, 160 feet high, about one mile in extent, and wooded, and several smaller islets and rocks; the shores of the larger island are broken into several bays. On the east side of the large island is Bloxham island, of small extent, and Lamb islet lies one cable from the north-east shore.*

Watson rock uncovers 18 feet at low water springs, and lies 2 cables from the south shore of Gibson island.

Bloxam shoal extends 6 cables north-eastward from the south-east extreme of Bloxham island, and extends northward of Gibson islands at that distance, with depths of one to 3 fathoms over it.

Gunboat harbour, between Gibson and Bloxham islands, is a small harbour, which faces the south-east, affording temporary anchorage to small vessels, in 4 to 10 fathoms, one cable within the entrance, in mid-channel.

Bedford island, of small extent, lies 5 cables N.N.W. from the larger Gibson island. Bedford spit extends 3 cables S.W. from Bedford island. The channel between Bedford and Gibson islands has depths of 4 fathoms and less in it; this passage is not recommended. Marrack island lies 5 cables N.N.W. of Bedford island and is one mile in extent. Marrack rock, which uncovers, lies nearly in mid-channel between Bedford and Marrack islands.

Port Fleming.—Between Marrack, Bedford, and Gibson islands, and the mainland eastward of them there is a good harbour named port Fleming, of even soundings, from 3 to 7 fathoms, with muddy bottom, and very little tide. Captain Madden, an old trader and pilot, stated that he always found this harbour good, well sheltered from winds, and free from currents and sea.

The approach to port Fleming from the north is by Arthur passage.

* See Admiralty plan :—Ogden channel, No 1,901; scale, $m = 1.0$ inches.

Good anchorage is reported on the west side of Smith island, opposite mount McGrath.

KENNEDY ISLAND is $5\frac{1}{2}$ miles long in a north-west and south-east direction, with an average breadth of 3 miles, is wooded, rising gradually, and culminates near the middle in two conspicuous peaks, 2,765 and 2,470 feet high respectively. The western and southern coasts of Kennedy island are bold, and little broken; the northern coasts have not been examined in detail.*

Cardena bay, is an open bay on the south-east side of Kennedy island, and is skirted by a mud bank, which extends over 5 cables from the shore, with depths of 5 to 10 fathoms upon it.

It is a good temporary stopping place in case of fogs or darkness on reaching Chatham sound. Anchorage may be found on the bank, in 7 to 8 fathoms good holding-ground, at 3 cables from the shore of Kennedy island; and it is the best anchorage in the vicinity of Skeena river, sheltered from North and S.E.

Lewis island, situated one mile southward of Kennedy island, is low, wooded, narrow, and $2\frac{1}{2}$ miles long, in a north-west and south-east direction.

A shoal upon which the "Corona" was wrecked, extends 3 cables S.E. by E. $\frac{1}{4}$ E. from Henderson point, the south-east extreme of Lewis island; from Henderson point it has a depth of 9 feet at the extreme, and a rock that dries 10 feet at low water lies one cable from the point in the same direction.

ARTHUR PASSAGE, between Kennedy and Lewis islands, is about 5 miles long, in a general north-west and south-east direction, and about one mile wide, with depths of 18 to 63 fathoms, mud.

Herbert reefs lie on the western side of Arthur passage, about 4 cables from the north-east extreme of Lewis island, and 6 cables distant from Kennedy island. This dangerous reef consists of two rocks which uncover at low water, with depths of 7 and 9 fathoms between them, lying north-west and south-east, distant 5 cables from each other. There are depths of 37 fathoms and over at one cable northward, and of 20 fathoms at one cable southward of Herbert reefs.

The eastern and smaller Genn island seen in line with the south extreme of White Cliff island, bearing N.W. $\frac{1}{2}$ W., leads northward of Herbert reefs.

* See Admiralty plan:—Brown and Edye passages, No. 2,453; scale, $m = 1$ inch.

Lawson harbour, on the north-west side of Lewis island, is about 5 cables long in a north-west and south-east direction, and 5 cables wide. Anchorage for small vessels may be found in 4 fathoms, in mid-channel, about one cable within Lawson harbour.

Elliott island, north-west of Lewis island, is low and wooded ; about $1\frac{1}{4}$ miles long in a W.N.W. and E.S.E. direction, with a greatest breadth of three-quarters of a mile. Bloxam passage, between Lewis and Elliott islands, and connecting Arthur and Chismore passages, is about 2 cables wide, with a depth of 21 fathoms in mid-channel.

Elizabeth island lies westward of Elliott island, is nearly 3 miles long in a W.N.W. and E.S.E. direction, with an average breadth of three-quarters of a mile. With the exception of a hill, 334 feet high, near its eastern end, this island is low and wooded.

Bamfield islands, a group of small islets, lie about a quarter of a mile from the northern shore of Elizabeth island ; 3 cables eastward from these islands are some reefs. A deep but narrow passage exists between Bamfield islands and the reefs.

CHISMORE PASSAGE, between Porcher island on the south and Lewis, Elliott, and Elizabeth islands to the north, is about 4 miles long in a W.N.W. and E.S.E. direction, and from 2 to 5 cables wide, with depths of 4 to 21 fathoms, mud. It is obstructed by foul ground at its south-eastern end, and is only accessible for ships by Bloxham passage, a narrow channel leading into Arthur passage between Lewis and Elliott islands.

Kelp passage, between Lewis and Porcher islands, is available only for boats.

Elizabeth rock, which uncovers at low water, lies one cable from the south shore of Elizabeth island, at one mile within the western entrance of Chismore passage.

Anchorage may be obtained, in mid-channel, in 7 to 10 fathoms, 2 cables from the south shore of Elliott island, with Genn islands seen midway between Elliott and Elizabeth islands, bearing N.N.W. $\frac{3}{4}$ W. Good holding ground and excellent shelter.

CHALMERS ANCHORAGE, on the north-west side of Elliott island, is formed at the junction of that island with Elizabeth island.

Anchorage may be found in 13 to 14 fathoms, at 2 cables from the north-west extreme of Elliott island; with that extreme seen in line with south extreme of White Cliff island, bearing N.N.E. $\frac{1}{2}$ E.

White Cliff island, 260 feet high, situated nearly midway between Kennedy and Elliott islands, at 6 cables northward of the latter, is about half a mile long in a north and south direction; its south extreme terminating in high, bold, white cliffs. A ledge extends 2 cables southward from White Cliff island. Marble has been quarried at White Cliff island.

Cecil patch, seldom marked by kelp, has 4 fathoms upon it, and lies one mile West from the south extreme of White Cliff island. There are depths of 7 and 18 fathoms at 100 yards from the patch.

The summit of Kennedy island (Elizabeth peak), seen in line with the south extreme of White Cliff island, bearing E. by S., will lead northward of Cecil patch.

Genn islands consist of two small wooded islands, about 120 feet high, lying close together in an east and west direction. The eastern and smaller island lies $2\frac{1}{2}$ miles N.W. $\frac{1}{2}$ W. from the south extreme of White Cliff island.

Bribery island consists of low rocks very little above high water, and lies 8 cables W. by S. from the western Genn island.

Lawyer group consist of two principal islands, and several smaller ones, about one mile in extent, in a N.W. by W. and S.E. by E. direction. The eastern and smallest island of the group lies 5 cables W. by S. from Bribery island.

Cruice rock, of small extent, covers at three-quarters flood, and lies $2\frac{1}{4}$ cables W. $\frac{1}{2}$ N. from the western Lawyer island.

Hunt point (Quil mass) the north extreme of Porcher island, is about 3 miles westward of Chismore passage. Temporary anchorage in off shore winds may be had under the point in about 10 fathoms.

MALACCA PASSAGE, situated between Porcher island and the Genn and Lawyer groups, is about 6 miles long, in a W. by N. and E. by S. direction, and about $1\frac{3}{4}$ miles wide, with depths of 21 to 81 fathoms, mud, the latter depth being found in the western portion of the channel.

See chart, No. 2,453.

Directions.—The summit of Kennedy island, Elizabeth peak (bare patches on north-west side), seen in line with the south extreme of White Cliff island, bearing E. by S., will lead through Malacca passage.

SKEENA RIVER, the largest river on the coast of British Columbia, northward of Fraser river, takes its rise in lake Babine, near the village of Naas glee, about 200 miles beyond port Essington. At 120 miles from port Essington the river divides into three branches, known as the Forks of the Skeena, the principal branch taking a northerly direction, the others a north-west and south-east direction respectively.

The shores of Skeena are said to be low, covered with small hard wood and cotton trees; also good sized white oaks, similar to those found on the banks of Fraser river. The shores at the entrance are densely wooded, chiefly cedar and hemlock, and bear evidence of a remarkably wet climate.

Caution.—Unless under the guidance of a pilot, as the channels of the Skeena are subject to periodical changes, it is recommended, before attempting them, to buoy the channel by boats or other means.

Navigable depths.—At 6 miles below port Essington, the river divides into three channels named North, Middle and Telegraph passages.

North channel (The Slue) is suitable only for small craft. It is about 3 cables wide, with several sunken rocks, and only $2\frac{1}{2}$ fathoms of water, and the current is very swift. Middle channel is obstructed by shifting sand banks, and is only fit for boats. Telegraph passage is the main passage with not less than 4 fathoms in the channel. For about 20 miles above port Essington the Skeena is available for vessels drawing 4 feet water; beyond that distance it is only navigable for canoes. The head of navigation, for vessels drawing over 6 feet, may be said to terminate 6 miles beyond port Essington, and 21 miles from the mouth of the river.

The river is navigable for light-draught steamers as far as Mumford landing, 60 miles inland, and 200 miles further for canoes.

The head of tidal water is about 18 miles above port Essington. The river is navigable with difficulty for small stern-wheelers about

38 miles above tidal water to Kitsumgallum, where there is a trail up the valley of Kitsumgallum river, to the head waters of Nass river.

It is about 100 miles from tidal water, with a rise of 725 feet to Skeena forks or Hazelton, a settlement not far from the abandoned fort Stager.

Telegraph passage, the southernmost and principal channel of Skeena river, is about 8 miles long N.W. by N. and S.E. by S., with an average width of $1\frac{1}{2}$ miles.

The western side of the channel is rendered dangerous by sand flats, some of which dry, extending from the eastern side of Kennedy island, but the eastern side has depths of 4 to 17 fathoms.

Middle passage, situated between Kennedy and De Horsey islands, is obstructed at its western entrance by sand flats, some of which uncover, leaving a passage only available for boats.

North passage, between Tsimpsean peninsula and Smith and De Horsey islands, has a depth of about $2\frac{1}{2}$ fathoms in some parts, and is not recommended. Mount McGrath on Smith island is conspicuous, 2,220 feet high. At the entrance to this passage several dangers lie nearly in mid-channel; the navigable channel lies on the south shore, and is barely one cable wide in some parts.

Near the entrance of North Skeena passage there is a considerable mining camp called Willaclagh.

From Inverness (Woodcock landing), on the north shore of North Skeena passage, a narrow inlet extends westward of north, joining the sea, near Coast islet, the inlet continuing north-westerly joins the large basin in which Oldfield island (containing mount Oldfield, 2,300 feet high) is situated. This basin enters Malacca passage between Lima point and Coast islet, and connects with Metlah Catlah bay through Venn creek. The land west of Oldfield basin, E.S.E. from Metlah Catlah, has been named Digby island.

Anchorage.—There is no good anchorage off Inverness, the ground being hard and pebbles, and the ebb-stream very strong. There is a dangerous rock between Leer point and the village, and any vessel anchoring off Inverness would be very liable to be set down on it.

Rocks.—Three dangerous sunken rocks lie in and near the fairway in port Essington. The northern rock, which dries 2 feet at ordinary low water, lies with Veitch point S.W. by S. distant $2\frac{1}{10}$ miles, and northern extreme of Village island, at the western side of the entrance to Ecstall river, S.E. $\frac{3}{4}$ E. The centre rock, which is the most dangerous, dries one foot at low water springs, and lies with Vietch point S.W. $\frac{3}{4}$ S. distant $2\frac{1}{10}$ miles, and northern extreme of Village island S. by E. $\frac{1}{2}$ E. The southern sunken rock is awash at ordinary low water, and lies with Vietch point S.W. distant $2\frac{1}{10}$ miles, and northern extreme of Village island S.E. $\frac{3}{4}$ E. distant 50 yards.

A black spar buoy is moored on the centre rock lying on the edge of the shoal water northward of Village island. The buoy will lie flat at low water, and is liable to be run under by the tidal stream.

PORT ESSINGTON (Spük sūt) lies on the south shore of Skeena river, about 11 miles from its mouth and 6 miles from De Horsey island, and affords extensive anchorage. The village is situated on the west side of a point forming the angle between the Skeena and Ecstall river.

The settlement, Balmoral, is on the east side of the mouth of Ecstall river. Steam-vessels call regularly at the large cannery at Balmoral.

At 2 miles above Raspberry islands, on the southern shore, is a hot spring, 110° Fhr., about 100 yards from the shore, the inhabitants use it for rheumatic affections.

Anchorage with good holding ground will be found in mid-channel abreast port Essington, in 4 to 7 fathoms, mud.

A heavy cross-sea is caused by strong winds from seaward between N.W. to S.E., and vessels would be very liable to foul and trip their anchors.

Raspberry islands, situated eastward of port Essington, consist of two wooded islets, lying close to the eastern shore; they are joined at low water, and the passage between them and the southern shore is only fit for boats.

Supplies.—Potatoes of large size and good quality are plentiful; also berries, which are dried by the Indians for their winter food. The Skeena is a prolific salmon stream, and fish of the finest quality

are procured here. Good timber is plentiful and of large size, especially spruce and yellow Alaska cedar.

Tides and tidal streams.—The tides are subject to considerable diurnal inequality. It is high water at full and change in port Essington at 1h. 0m.; spring rise 24 feet, neaps 15 feet. The flood stream at the entrance attains the velocity of 4, and the ebb 5 knots an hour at springs, and the latter is at times much accelerated by freshets.

Winds.—During September Easterly and S.E. winds, accompanied by almost continuous rain, with frequent squalls, have been experienced.

Coal.—Kitsagatla, on Skeena river, is reported to be an extensive coal country, the seams being cut through by the river, and from 3 to 35 feet thick.

Ice.—The North passage of Skeena river is blocked full of ice nearly all the winter, but it seldom reaches down as far as Kennedy island. Port Fleming is free from ice.

From Ecstall river comes the greater part of the ice-floes which encumber the Skeena in the cold season. Strong N.E. gales in winter interrupt communication with the shore, and though not frozen over there is much loose ice, as also quantities of heavy drift-wood.

Ships could not remain at port Essington during the months of December, January, February and March, and well into April. The snowfall has been about 6 feet on the level.

See chart, No. 2,453.

CHAPTER XII.

CHATHAM SOUND, EDYE AND BROWN PASSAGES.
AND DIXON ENTRANCE.VARIATION, $27^{\circ} 0'$ East in 1898.

CHATHAM SOUND is about 38 miles long N.W. by N. and S.E. by S., and from 7 to 14 miles wide, lying between the Tsimpsean peninsula and Stephens and Dundas islands.*

In the middle of the southern portion are two groups of islands (Rachel and Lucy islands) together with other detached islets and rocks, especially on the north shore.

Chatham sound communicates with Hecate strait by three channels, Edye passage, in the south-west corner of the sound, being the channel usually taken (*see* page 467). Brown passage, south of Dundas islands, though comparatively wide, has strong and irregular tides near its western end; and a patch of rocks awash at high water lies nearly in mid-channel.

Landmarks.—On the north shore, in the south-eastern portion of Chatham sound, mount Oldfield and mount McGrath, 2,300 and 2,220 feet high respectively, are conspicuous.

With the exception of a cluster of bare rocks (Gull rocks) off the mouth of Edye passage, the islets in that portion of the sound are wooded, and of a conspicuous dark colour.

On South Dundas island, there are four conspicuous peaks, the eastern and highest of which is 1,400 feet high. Northward of Metlah Catlah, Mission mountain, and Deer mound, of rounded form, will be seen rising from comparatively low land to 1,310 and 2,230 feet respectively.

Coast mound, a conspicuous hill of oval shape, 750 feet high, will be seen on Middle Dundas island, with a chain of wooded islets, of a peculiarly dark colour, fringing the shore.

* *See* Admiralty plan :—Brown and Edye passages, No. 2,453; scale, $m = 1$ inch; also Admiralty chart :—Cape Caution to port Simpson, northern portion. No. 1,923*a*; scale, $m = 0.25$ of an inch.

Near the north-east extreme of North Dundas island, Table hill with a flat summit rises 700 feet, and is conspicuous. Southward of Table hill, Thumb peak rises 2,500 feet. With the exception of one small islet (Grassy islet), the islets and rocks in the northern portion of Chatham sound are bare and conspicuous.

At 2 miles southward of port Simpson, mount Griffin (Waverly peak), a mountain with a sharp summit, rises to 1,410 feet. South-east of mount Griffin, the ridge has several conspicuous peaks rising to nearly 3,000 feet, amongst which are Leading peak and Basil Lump 2,200 and 2,960 feet high respectively.

Mount McNeil, on the north side of Work channel, has a snow-clad summit, of conical shape, 4,300 feet high.

Dangers.—The southern portion of Chatham sound is comparatively free from danger, the rocky clusters being of considerable elevation above high water and moderately steep-to. Northward of Metlah Catlah bay, however, ledges which uncover at low water extend in many places 2 miles from the eastern shore. On the western side of the sound also, there are several off-lying detached sunken rocks, with deep water close to them. Abreast port Simpson, two clusters of rocks lie in the fairway of the sound; and being but little elevated above high water, render that portion of the sound dangerous by night or in thick weather.

Caution.—Northward of Metlah Catlah bay, during a fog, or if uncertain of the position, the eastern shores of Chatham sound should not be approached under 70 fathoms; nor the western shores under 40 fathoms.

Anchorage.—Anchorage will be found off the north entrance of Skeena river (p. 445), in Metlah Catlah bay (p. 452), Duncan bay (p. 456), Big bay (p. 458), Pearl harbour (p. 460), and Port Simpson (p. 462), Refuge bay (p. 469), and in Qlawdzeet (p. 470).

Gull rocks consist of three bare rocks, about half a mile in extent, the highest rock being about 30 feet above high water, lying off the north entrance of Edye passage, 3 miles W. by N., from the north-west extreme of Porcher island (Hunt point), and $3\frac{1}{2}$ miles from the nearest portion of Prescott island.

Ettrick rock, a dangerous patch of small extent, which uncovers 3 feet at low water, lies $1\frac{1}{2}$ miles S.E. by E. from the centre of the

Gull rocks. Havelock rock, of small extent and uncovering 6 feet at low water, lies $2\frac{1}{2}$ miles S.E. by E. from the centre of Gull rocks, and one mile S.W. by W. from Hunt point. Both Ettrick and Havelock rocks have deep water close to.

Kitson island, situated off the mouth of North Skeena passage, is about 2 cables in extent, and lies $1\frac{1}{2}$ miles N.E. $\frac{1}{2}$ E. from Holland island. Shoal ground, with depths of 6 to 8 feet on it at ordinary low water, extends about 6 cables in a south-easterly direction from the southern end of Kitson island; near the outer end of this shoal ground the water deepens to 3 fathoms.

The passage between Kitson island and Leer point is only navigable by boats.

Green Top island, 15 feet high, is small, with a patch of shrub on its summit, and lies $4\frac{1}{2}$ miles N.W. by W. $\frac{1}{4}$ W. from the western island of the Lawyer group. Holland island, small, wooded, and 10 feet high, lies $1\frac{3}{4}$ miles E. by N. $\frac{3}{4}$ N. from Green Top islet.

Kinnahan islands, two in number, and about half a mile long, lie close together in a N.W. and S.E. direction, about one mile from the shore of Tsimpsean peninsula; they are wooded, about 200 feet high. The south extreme of South Kinnahan islands lies $1\frac{1}{4}$ miles N.N.W. from Green Top island.

Rachel islands (Lak ôh witz), two in number, about one mile in extent, in a N.W. and S.E. direction, wooded and about 200 feet high, lie nearly midway between Tsimpsean peninsula and Stephens island. The south-east extreme of the south-east Rachel island lies $3\frac{3}{4}$ miles N.W. from the northernmost Gull rock.

Alexandra patch is nearly circular, one mile in diameter, within the depth of 20 fathoms. This bank has depths of 10 to 17 fathoms, over a bottom of mud and sand. The eastern edge of Alexandra patch lies one mile North of the north Rachel island.

Lucy islands (Lachspanner), a group of islands and high-water rocks, the larger islands being wooded and the small bare, lie nearly in the middle of the sound abreast Metlah Catlah bay, and are about one mile in extent in an east and west direction. The summit of the eastern and largest island is 200 feet high, and lies $5\frac{1}{2}$ miles N.W. from the north extreme of the north Rachel island. This group is

of great use when making Metlah Catlah during thick weather, as being comparatively free from danger it may be approached (except on the south side), and, when made, the easternmost island of the group kept astern bearing S.W. $\frac{1}{2}$ W. will lead to the entrance of Metlah Catlah bay.

A ledge of rocks, $1\frac{1}{2}$ miles in length in a north-west and south-east direction, which partially uncover, extends from 4 to 9 cables southward, and to south-westward of the Lucy group; the outer rock lying 9 cables South from the summit of the eastern island of the group. The north-western rock dries 3 feet and lies $2\frac{1}{2}$ cables S.W. $\frac{1}{2}$ W., from the nearest island of the group, and is marked by kelp.

TSIMPSEAN PENINSULA separates Skeena river from Work channel, being barely half a mile wide abreast the mouth of Skip river. This peninsula (which takes its name from a tribe of Indians residing upon it) is nearly 32 miles long, in a general north-west and south-east direction, with a greatest breadth of 9 miles.

The head-quarters of the tribe of Indians inhabiting this peninsula are at Metlah Catlah and port Simpson.

METLAH CATLAH BAY is formed between the shore of the Tsimpsean peninsula and the north-west coast of Digby island, and is protected from the westward by Tugwell island and the reefs which join that island to the shore of the peninsula. The bay from its entrance takes a general northerly direction for one mile, gradually narrowing as the settlement is approached; it then turns sharply to the east and south-east, the latter part being known as Venn creek.*

Metlah Catlah village, an Indian settlement, founded as a missionary station, is situated upon Mission point. The houses forming the mission are built upon an elevated bank, about 100 feet above high-water mark, and are mostly whitewashed; the whole settlement from the offing presenting the appearance of a picturesque English village. The most conspicuous buildings being the church, school-house, and mission house.

Tugwell island lies about 2 miles south-westward of Metlah Catlah village, and those desirous of communicating with that place usually anchor off the eastern side of the island, or off its northern side in Duncan bay, according to circumstances. Tugwell island is

See chart, No. 2,453.

* *See Admiralty plan :—Metlah Catlah bay, No. 364; scale, m = 3 inches.*

about $1\frac{1}{2}$ miles long, in a north and south direction, with an average breadth of half a mile, and is fringed by dangerous rocky ground, marked by kelp, especially on its south-eastern side. It is wooded (the tops of the trees being about 200 feet high), and is connected at low water with Mission point upon which Metlah Catlah village stands.

A black buoy, in $3\frac{1}{2}$ fathoms, marks the south-east side of Tugwell island reef with Dawes point W.N.W. distant 6 cables.

Dawes rock, awash at low water, lies 4 cables S.S.W. $\frac{1}{2}$ W. from the south extreme of Tugwell island (Dawes point). Between Dawes rock and Dawes point, large boulder rocks uncover at low water, and extend along the western side of Tugwell island, generally marked by kelp.

Enfield rock has 5 fathoms on it, and lies one mile S.S.W. $\frac{1}{2}$ W. from the south extreme of Tugwell island, with foul ground between.

Caution.—Vessels should pass westward of Enfield rock, in not less than 10 fathoms, at low water.

Alford reefs are a dangerous cluster of rocks, about 3 cables in extent north and south, lying at the entrance of Metlah Catlah bay. The northern rock, which uncovers two feet at low water, lies 6 cables N.W. by W. from Quartermaster rock. A red can buoy is moored in 6 fathoms, half a cable from the west end of these reefs.

The south extreme of the large Cridge island, in line with Quartermaster rock, bearing E. by N., will lead southward of the reefs; the summit of Knight island kept midway between Pike and Shrub islands, bearing N.N.E. $\frac{1}{2}$ E., will lead westward.

Quartermaster rock, a small black rock, 2 feet above high water, lies 4 cables W. by S. from the south extreme of the large Cridge island. A rock, which uncovers one foot at low water, lies $1\frac{1}{2}$ cables South from Quartermaster rock. Midge rock, a patch of small extent, which uncovers at low water, lies half a mile North from Quartermaster rock.

Cridge islands, two in number, lie at the south-east entrance of Metlah Catlah bay: the eastern and larger island is 150 feet high, and lies 2 cables from the eastern shore of the bay (Digby islands).

The western island is small, 100 feet high, and lies 2 cables W. by S. from the south extreme of the larger Cridge island. Both islands are wooded.

Devastation island lies almost in the centre of the bay half a mile eastward of Tugwell island, and is nearly one-third of a mile long, north and south, and 200 yards broad. The island is wooded, 150 feet high, and two rocky islets lie close to its south extreme, from the northern extreme of this island, a shoal, portions of which uncover at low water, extends half a mile N.E.

Knight island, barely 10 feet high, small, with stunted scrub upon it, lies 4 cables E. $\frac{3}{4}$ S. from the north extreme of Devastation island. Armour rock, with 9 feet water over it, lies S.E. by S., distant one cable from Knight island. Pike island, 100 feet high and wooded, is about one-third of a mile long in a north and south direction, and its south extreme lies 7 cables E.N.E. from the north end of Devastation island. Carr islet, small, about 60 feet high, lies half a mile N. by E. from the north extreme of Devastation island, and is connected at low water with the spit which joins Tugwell island and Observation point.

Shrub islet lies $1\frac{1}{2}$ cables W.N.W. from the north side of Pike island, is of small extent, and low. A shoal, the outer portion of which uncovers at low water, extends nearly 2 cables from the north side of Shrub islet, and is the outer portion of a bank of sand with patches of rock upon it, which connects Pike island, Shrub islet, Gribbell and Isabel islands at low water.

A small stone beacon, surmounted by a staff and cross piece painted red, 8 feet above high water, stands on the end of the rocky ledge $1\frac{1}{2}$ cables W. by N. $\frac{3}{4}$ N. from Shrub islet. This beacon should not be approached nearer than 70 feet.

Kelp rock, a dangerous sunken rock, lies nearly midway between Shrub islet and Observation point, 2 cables from either. The navigable channel between Shrub islet and Observation point, is contracted by Kelp rock to barely half a cable in width at low water.

A black buoy, with top mark, is moored close eastward of Kelp rock on the north side of the channel. A black spar buoy, in 10 feet, on the point of the reef $1\frac{1}{2}$ cables eastward. And a black spar buoy, in 6 feet, also on north side, with Mission point N.N.E., distant

2 cables. This buoy will lie flat at low water; the channel is close to.

Gribbell island, situated on the south side of the channel leading into Venn creek, is about the same size as Shrub islet, from which it is distant 5 cables N.E. A small rocky islet lies about half a cable off the north side of Gribbell island.

Isabel island lies $1\frac{1}{2}$ cables N.N.E. from the summit of Gribbell island, and $1\frac{3}{4}$ cables South from Mission point. A dangerous sunken rock lies half a cable westward of Isabel island, and reduces the navigable channel at low water to barely 60 yards in width.

Venn creek takes an E. by S. direction from Mission point, but is only suitable for small vessels. There are several fishing stations upon the shores of this creek, in which the Indians obtain salmon. Venn creek at its head connects with the unexplored Oldfield basin. east of Digby island, which extends southward and eastward, connecting with Malacca and North Skeena passages.

Anchorage will be found in 11 to 12 fathoms, mud bottom, 3 cables off the western side of Devastation island, with the south extreme of Devastation island seen in line with the smaller Cridge island, bearing S.E. by S., and the south extreme of Carr islet seen in line with the flagstaff on Mission point, bearing N.E. $\frac{1}{4}$ N.

Small vessels occasionally proceed into Venn creek and anchor off Metlah Catlah village, in 10 to 12 fathoms, with the flagstaff on Mission point bearing W. by S. distant 3 to 4 cables. The channel into this anchorage is barely 60 yards wide at low water, when the dangers on either side indicate themselves, but the passage should only be attempted by short vessels, of light draught; and at all times it would be well to place boats upon the rock which lies westward of Isabel island, and likewise on Kelp rock, should the buoys marking those dangers not be in position.

Directions.—Approaching Metlah Catlah from the south-eastward, if the Lawyer group of islands be kept in line with Green Top island bearing S.E. by E. $\frac{1}{4}$ E., that mark astern will lead directly to the entrance of Metlah Catlah bay.

During a fog or in thick weather, when approaching Metlah Catlah from the south-eastward, do not shoal to less than 40 fathoms, and

on such occasions the Lucy islands should be cautiously steered for and sighted, taking care to avoid the reefs which extend from the south and south-west side of the group. The large or eastern Lucy island should be brought to bear S.W. $\frac{3}{4}$ W. astern, and a N.E. $\frac{3}{4}$ E. course should take a vessel to the entrance of Metlah Catlah bay. The bank of 10 fathoms (and less water) extends nearly one mile southward of Tugwell island, and the hand lead (if proceeding slowly) should indicate the position. During summer and autumn large quantities of kelp mark this bank.

To enter, Knight island, kept midway between Shrub and Pike islands bearing N.N.E. $\frac{1}{2}$ E., leads in to the bay, between Tugwell island and Alford reefs, in 25 fathoms. (*See View on plan No. 364.*)

Carr islet, just shut in with the western extreme of Devastation island, bearing N. by E. northerly, will lead eastward of the foul ground off the south-eastern part of Tugwell island. The south extreme of the large Cridge island seen in line with Quartermaster rock, and touching the north extreme of the small Cridge island bearing E. by N., will lead southward of the dangers off Tugwell island.

Auriol point, just open north of Shrub islet bearing N.E. $\frac{1}{2}$ E., leads between the foul ground southward of Carr island and the ledge extending from the north extreme of Devastation island, and when Ryan point comes open east of Carr island bearing N.W. $\frac{1}{2}$ N. a course may be steered as requisite for Venn creek.

Tides.—It is high water, full and change, at Metlah Catlah at noon; springs rise 21 feet, neaps 17 feet.

DUNCAN BAY, on the north side of Tugwell island, affords anchorage when desirous of communicating with Metlah Catlah during the prevalence of south-easterly winds.

The entrance to this bay between the north extreme of Tugwell island and Ryan point is about $1\frac{3}{4}$ miles wide, and takes an easterly direction for about $1\frac{1}{2}$ miles, terminating in the sandspit which connects Tugwell island and Tsimpsean peninsula (Observation point) at low water.

A shoal, with 3 fathoms (and probably less) water upon it, extends half a mile northward of Tugwell island. Ledges, which uncover, and sunken rocks, extend nearly 7 cables from the north shore of Duncan bay.

Hecate rock, with 10 feet water on it, lies near the head of Duncan bay, 3 cables from the north shore and half a mile W. by N. from Observation point.

Directions.—If desirous of anchoring in Duncan bay, pass one mile north-westward of Tugwell island, and when the south extreme of Gribbell island is seen just open of Observation point, bearing E. $\frac{1}{2}$ S., that mark should be steered for; a berth should be taken up on that bearing, in 8 to 10 fathoms, mud, with Chapman point, the north-west extreme of Tugwell island, bearing S.W. by W.

TREE BLUFF, the south entrance point of Big bay, lies 5 miles N.N.W. $\frac{1}{2}$ W. from Ryan point, the north entrance point of Duncan bay. The shore northward of Ryan point is low and wooded for 3 miles back from the coast, where it rises into high land. Two streams enter the sound on this part of the coast, and there are two islets lying close to the shore, respectively one and 2 miles northward of Ryan point. The former (Swamp islet) is covered with low grass, and lies about 5 cables from the shore. The latter islet is bare (Slippery rock) about 4 cables from the shore.*

Immediately southward of Tree bluff there is a wooded hill, close to the shore, 250 feet high.

Between Metlah Catlah and Big bays, dangerous ledges extend off shore in many places to the distance of 2 miles. These ledges uncover at low water, and are steep-to. Abreast Tree bluff the edge of the bank, which dries at low water, lies $1\frac{1}{2}$ miles from the shore.

Hodgson reefs, a dangerous cluster, lie northward of Duncan bay; their southern part covers at half flood, and lies 2 miles N.W. from the north-west extreme of Tugwell island, and $1\frac{3}{4}$ miles W. $\frac{3}{4}$ S. from Ryan point. From that position, dangerous sunken rocks extend in a N.N.W. direction for 2 miles.

A red can buoy, in 5 fathoms, marks the south-west extreme of the reefs, with Ryan point E. $\frac{1}{2}$ N., distant $1\frac{6}{16}$ miles.

The south side of Kinnahan islands, just showing clear of the south end of Tugwell island bearing S.E. $\frac{3}{4}$ E., leads westward of Hodgson reefs; and the eastern island of the Lucy group should not be brought to bear south of S. by E. (astern) until mount Griffin (over port Simpson) is seen in line with the north end of Burnt-cliff island N. by E. $\frac{1}{3}$ E.; this mark leads westward of all dangers off the entrance to Big bay.

* See chart, No. 1,923a.

BIG BAY (*Lak hou*), the entrance to which between Tree bluff and South island is $2\frac{1}{2}$ miles wide, takes an easterly direction for $3\frac{1}{2}$ miles. At its head, which is skirted by a sand flat, which dries about half a mile from the shore at low water, several streams flow into the bay; this part being known as Salmon river bight.*

There is confined anchorage, southward of Swallow island, at the head of Big bay in 4 fathoms, but the space is nowhere more than 3 cables across. The anchorage mark is the ship-building shed just shewing along the bank of the river. The little rock, one foot high, on the south edge of Swallow island ledge, is a good guide when entering at high water.

Georgetown is a thriving little settlement on the banks of the river eastward of Swallow island. Two steam-vessels, of 150 and 60 tons, have already been built. Mail steamers call, and anchor in the 4-fathoms bight.

South island, situated at the north-west entrance of Big bay, is small and wooded, with a sharp summit, 150 feet high, and connected with the mainland by foul ground, dry at low water, and one mile in width. A ledge of sunken rocks, with depths of 6 and 12 feet, extends 5 cables S. $\frac{1}{2}$ W. from the south side of South island. Haycock island lies 3 cables East from the summit of South island. A sandbank, about one cable in extent, with 3 fathoms water, lies 3 cables S. $\frac{1}{2}$ E. from Haycock island. White Cliff island lies 9 cables E. $\frac{1}{2}$ S. from Haycock island; it is small, and terminates in high, white, conspicuous cliffs. Shattock point, 3 cables E.N.E. from White Cliff island, is the north-west entrance point of Salmon river bight.

Swallow island lies one mile E. $\frac{3}{4}$ S. from White Cliff island and one cable from the north shore. Curlew rock is small, about 2 feet above high water, and lies 5 cables South from Swallow island.

Ripple bank, at the entrance to Big bay, is about 2 cables in extent in an East and West direction; the shoalest spot near the eastern end, having 12 feet water over it, sandy bottom, lies $1\frac{1}{10}$ miles S. by W. $\frac{3}{4}$ W. from the summit of South island. This bank usually indicates itself by tide rippings.

* See plan:—Big bay, on Admiralty chart, No. 2,426; scale, $m = 3$ inches.

Escape reefs are a dangerous cluster at the entrance to Big bay, E.S.E. of Ripple bank. The outer or western reef has 4 feet over it, and lies $1\frac{1}{6}$ miles S. $\frac{3}{4}$ W. from the summit of South island. The eastern reef has 5 feet over it, and lies half a mile E.N.E. from the western one. There are depths of 16 and 17 fathoms between these reefs. During the season of kelp growth, that weed is found in great quantities upon Escape reefs, and near the head of Big bay.

Anchorage will be found in Big bay, in 11 and 12 fathoms, mud, with Haycock island in line with the north extreme of South island bearing N.W. by W. $\frac{3}{4}$ W.; and White Cliff island in line with mount Griffin bearing N. by W. $\frac{1}{4}$ W.

Directions.—Approaching Big bay from the southward mount Griffin should be kept in line with the north extreme of Burnt-cliff island N. by E. $\frac{1}{2}$ E. until Sharp peak on the ridge south-east of mount Griffin is in line with the south end of Swallow island bearing E. by N.; the latter mark will lead directly into Big bay; anchor with Sharp peak open south of Swallow island, in the position and depth above given.

Burnt-cliff island, situated northward of South island, is about half a mile long N.W. $\frac{1}{2}$ N., and S.E. $\frac{1}{2}$ S., and wooded, its highest point near its north end being 200 feet high. The north extreme of this island terminates in high red-brown cliffs; the north-east extreme is cultivated, and from that point a long bank of shingle, awash at high water, extends 3 cables N.E. The whole space inshore of South and Burnt-cliff islands uncovers at low water.

A ledge, which uncovers at low water, extends 3 cables N.W. from the north-west extreme of Burnt-cliff island. The channel between Burnt-cliff and One Tree islands is available only for boats.

One Tree island, 4 cables N.W. of Burnt-cliff island, is of small extent, with a sharp wooded summit 150 feet high. A low grassy point extends 100 yards in a northerly direction from the north extreme of One Tree island, at the extremity of which a high, conspicuous, solitary tree was standing in 1868. One Tree island forms the southern point of entrance to Cunningham passage, and the western shelter of Pearl harbour.

A ledge, which uncovers at low water, surrounds One Tree island; its greatest distance from the shore being $2\frac{1}{2}$ cables in a N.N.W. $\frac{1}{2}$ W. direction from the single tree.

Flat-top islands, a group lying northward of One Tree island, consists of three wooded islands, lying N.N.E. and S.S.W. of each other. The middle and longest island of the group is connected by a narrow grassy neck with the northern island, and the latter has a flat summit, covered in July with long grass; also a single stunted tree growing upon it (1868). The southernmost and smallest Flat-top island lies $3\frac{1}{2}$ cables N. by E. from the tree on One Tree island.

Ledges, which uncover at low water, and foul ground, surround the Flat-top group $1\frac{1}{2}$ cables distant.

FINLAYSON ISLAND, the largest in this locality, is $2\frac{3}{4}$ miles long N.W. $\frac{1}{2}$ N. and S.E. $\frac{1}{2}$ S., and one mile broad, 200 feet high, and wooded. The south extreme of the island terminates in cliffs; but the north extreme (Gordon point) is long and comparatively low, with ledges which uncover extending 2 cables northward; and on the north-west side of the island, about half a mile from the north-west extreme, is a large stream.

Red Cliff point, on the eastern side of Cunningham passage, half a mile N.E. from Fortune point, is rendered conspicuous by the high red-brown cliffs over it, and the small islet close to. Immediately south-east of the point there is a bay, with a sandy beach, and stream at its head.

PEARL HARBOUR, situated eastward of One Tree island, is nearly circular in shape, and half a mile across; on its eastern side is a bay, which dries nearly throughout at low water. On its south-east side, the high bank of shingle which extends from the north-east point of Burnt-cliff island effectually shelters the harbour from south-easterly winds.*

Anchorage.—Good anchorage will be found in 9 to 10 fathoms, mud bottom, near the middle of Pearl harbour, with Fortune point seen just open northward of the southernmost island of Flat-top group, bearing N.W. $\frac{1}{4}$ N., and the tree on One Tree island, W.S.W., distant 3 cables.

Otter anchorage, situated at the south end of Cunningham passage near the eastern shore, northward of Flat-top islands, is useful if communicating with the wood-cutting establishment abreast it.

See chart, No. 1,923a.

* *See Admiralty plan :—Pearl harbour, on sheet No. 2,426.*

Anchorage in 15 to 17 fathoms, sand, will be found with the centre of the wood-cutting establishment in line with **Leading peak**, bearing E. by N. $\frac{1}{2}$ N., and the northernmost Flat-top island (Green mound) S. by E., distant $1\frac{1}{2}$ cables.

The wood-cutting establishment, from which the principal supplies for port Simpson are obtained, is situated near the middle of a sandy bay, the northern point of the bay terminating in cliffs. The bay dries nearly throughout at low water.

From Otter anchorage there is a passage eastward of Flat-top islands into Pearl harbour, but this is not recommended to a stranger.

Sparrowhawk rock, a dangerous, sunken, pinnacle rock, on which is 5 feet water, lies nearly half a mile N.W. $\frac{1}{2}$ N. from the tree on One Tree island, and nearly in mid-channel, between One Tree and Finlayson island; it is steep-to, there being depths of 10 and 12 fathoms at 50 feet from it.

Sparrowhawk rock is marked by a conical buoy, coloured black and red in horizontal stripes.

Leading peak, a well defined peak of triangular shape (the first to the south-east on the ridge from mount Griffin), in line with the north extreme of Green mound, the northernmost islet of the Flat-top group, bearing E. by N. $\frac{1}{2}$ N., or that peak seen just open southward of the wood-cutting establishment abreast Otter anchorage, E. by N. $\frac{1}{2}$ N., will lead northward of Sparrowhawk rock.

Dodd rock lies a little over 2 cables South from Fortune point (Finlayson island); ledges which dry, connect it with that point.

Dodd rock only covers at the highest equinoctial tides, and is therefore an useful mark when entering Cunningham passage, as there is deep water a short distance southward of the rock.

Leading peak seen just open southward of the wood-cutting establishment abreast Otter anchorage, bearing E. by N. $\frac{1}{2}$ N., will lead southward of Dodd rock.

Directions.—Approaching Cunningham passage, Red Cliff point should be steered for in line with Fortune point, bearing N.E., until Leading peak is seen in line with the north Flat top island (Green mound), bearing E. by N. $\frac{1}{2}$ N., when the latter mark should be steered for. When the southern side of Burnt-cliff island is seen

open northward of the tree on One Tree islet, bearing S.S.E. $\frac{1}{2}$ E., a vessel will be eastward of Sparrowhawk rock; and if bound to port Simpson, may haul to the northward into Cunningham passage.

If bound into Pearl harbour, a mid-channel course from the above-mentioned position should be shaped between One Tree islet and the southernmost Flat top island. Belletti and Shattock points, two conspicuous wooded points on the eastern shore, should be kept in line, bearing S.E. by E., when entering Pearl harbour.

CUNNINGHAM PASSAGE, eastward of Finlayson island, between it and the Tsimpsean peninsula, lies in a N. by W. $\frac{1}{2}$ W., and S. by E. $\frac{1}{2}$ E. direction. The southern portion of this channel is barely $3\frac{1}{2}$ cables wide; but northward of Sarah point (the north-east extreme of Finlayson island) the passage widens, attaining, between One Tree islet and Gordon point, a width of $1\frac{1}{4}$ miles. The depths in mid-channel are from 16 to 36 fathoms.

Village island, at the south-west entrance of port Simpson, at about one cable from the shore, with which it is connected at half tide, is about a quarter of a mile long W.N.W. and E.S.E.; its south side forms a bay; and following the trend of that bay and round the southern extreme of the island, the houses of one of the Tsimpsean Indian villages will be seen. Village island near its north-west extreme is about 50 feet high, having on it a high pole.

One Tree islet is about 100 yards long east and west, covered with stunted trees, lying close to the north-west extreme of Village island.

Birnie island, at the north-west entrance of port Simpson, is three-quarters of a mile long North and South, and a little over 2 cables broad, its greatest elevation 330 feet being near the middle of the island. The shores of this island are comparatively bold and unbroken. Knox point, the south extreme of Birnie island, lies $1\frac{1}{2}$ miles North from Finlayson island. Ledges which uncover at low water extend one cable from Knox point.

PORT SIMPSON, the most spacious harbour on this part of the coast, is nearly $1\frac{1}{2}$ miles wide at its entrance between One Tree islet and Birnie island; thence it takes an easterly direction for about $3\frac{1}{2}$ miles, contracting gradually as the head is approached, and terminating in a narrow bight, named Stumaun bay, which dries across at low water. At its head are several streams, where salmon

are caught. The northern shore of the port is fringed with a rocky beach, compact and backed by rapidly rising high land. The southern shore is not so regular, nor so steep-to, the rocks which dry at low water, near the eastern part of the bay, extending from high-water mark in some places for the distance of nearly one-third of a mile. Coal has been found here.*

Port Simpson embraces over 4 square miles of water, from 4 to 20 fathoms deep with muddy bottom, good holding ground and free from rocks and shoals. It is easy of access from the sea, having no strong tidal streams, and well sheltered from all winds except the west, which here seldom blows. The prevailing winds are south-west and north-west, from which the harbour is perfectly protected.

Fort Simpson was formed by the Hudson Bay Company in 1831 as a trading post, on account of the good anchorage found in its vicinity and the facilities afforded to sailing-vessels. The trading post or fort stands near the south-west entrance point of the bay, close to the beach. A large entry gate faces the beach with a landing jetty of stones in front of it. A pier extends from the fort about N.N.W. $\frac{1}{2}$ W. to the low-water edge of the beach, or into a depth of 4 fathoms.

There is a hospital here.

The Hudson Bay Company's trading steam-vessel calls periodically at port Simpson, bringing supplies and returning with the furs.

Anchorage.—The usual anchorage is off the fort, in about 10 fathoms, mud bottom; a good berth being with Parkin island, seen just open northward of Birnie island, bearing N.W. (westerly), and (Gordon point) the north-west extreme of Finlayson island, in line with One Tree islet, W.S.W.

Hankin reefs are a dangerous cluster which partially uncover, situated south-west of Village island. The south-west extreme of these reefs uncovers 6 feet at low water, and lies a little over 3 cables S.W. by S. from the north-west extreme of Village island.

Sarah point, the north-east extreme of Finlayson island, bearing S. by E. $\frac{1}{2}$ E., leads westward; and the mouth of the lagoon on the north shore of port Simpson, seen open of One Tree islet, bearing N.E., leads northward of Hankin reefs.

* See Admiralty plan:—Port Simpson, on sheet No. 2,126; scale, $m = 3$ inches.

Harbour reefs, awash at high water, form a natural breakwater to port Simpson, protecting the anchorage from N.W. winds. The sunken plateau is about one square mile in extent, within the depth of 5 fathoms. The south-east portion of these reefs only covers at the highest tides, and lies $2\frac{1}{2}$ cables W.N.W. from One Tree islet.

The mouth of the lagoon on the north shore of port Simpson, bearing N. 47° E., leads south-eastward; Lizzie hill seen well open southward of Birnie island, bearing N.E., leads north-westward; and Parkin island seen open of the north extreme of Birnie island, bearing N.W. (westerly) leads north-eastward of Harbour reefs.

Dodd passage lies between One Tree islet and Harbour reefs, and is 2 cables wide, with depths of 6 to 8 fathoms in it. This is available for steam-vessels, but local knowledge is necessary.

Anchorage patch, with 18 feet water, sandy bottom, lies in the western portion of the anchorage ground off fort Simpson, with the fort gate bearing S.E. $\frac{1}{2}$ E., and the pole on the north-west extreme of Village island, S.W., distant $1\frac{1}{2}$ cables.

Choked passage, situated northward of Birnie island, has several ledges which uncover, and sunken dangers with deep water between them. This passage should not be attempted except in boats, and when using it keep near the north shore.

Inskip passage, the northern and principal entrance into port Simpson, is a little over 5 cables wide, and should invariably be used by a stranger. The depths in this channel are from 11 to 20 fathoms.

Directions.—Approaching port Simpson from the southward by Cunningham passage, the cliffs on the north-west extreme of Burnt-cliff island kept in line with the southernmost Flat-top island, bearing S. by E. $\frac{1}{4}$ E. (astern) will lead through until abreast Sarah point. Thence the mark for leading westward of Hankin reefs should be brought on astern (*see* p. 463), and when the lagoon mouth on north shore of port Simpson bears N.E. $\frac{1}{4}$ N., a course should be steered to pass north-westward of One Tree islet, and anchor in the position before mentioned.

If not wishing to enter by Dodd passage, when abreast Sarah point bring that point in line with the south point of a bay on the eastern shore of Cunningham passage, bearing S.E. $\frac{1}{4}$ E. (astern), which mark

will lead southward of the Harbour reefs, midway between that danger and Finlayson island.

Entering port Simpson by Inskip passage, Lizzie hill (on the north shore) well open southward of Birnie island bearing N.E., will lead 2 cables S.E. of that island and 3 cables N.W. of the Harbour reefs. When Parkin island is seen just open northward of Birnie island, bearing N.W. (westerly), that mark kept on astern will lead up to the anchorage, in the depth and position before mentioned.

Indian villages.—Before the Hudson bay post was built, the villages of the Tsimpsian Indians were at Metlah Catlah, but the tribe being great traders, as well as hunters, travelling long distances inland, they naturally migrated nearer the trading post. They have therefore settled along the beach on either side of the fort, and upon an island close opposite. Village island was formerly only connected with the main at half tide, but the Indians have constructed a trestle bridge, about 600 feet long and from 15 to 20 feet high, connecting the island and the main (Hay point).

Supplies.—Salmon, berries, shell fish, houlican oil, and dried seaweed form the principal diet of these Indians. Animal food (venison) is eaten when it can be obtained, but the winter food consists of dried salmon and houlican oil. The salmon are caught in immense quantities during the autumn and smoked over wood fires in huts. The houlican abounds in Nass river in the spring, the banks at low water being covered with dead fish. From this fish, which is larger and rounder than a sprat, a nutritious oil is extracted, and is the principal commodity of this people; the various tribes whose rivers the houlican do not visit, buying the oil in exchange for furs. Seaweed is taken in great quantities on the off-lying rocks during the low autumnal tides; it is dried and compressed into cakes and used as winter food. A great luxury with them is rice and molasses.

Wood, water, potatoes, and crabs, can be obtained in port Simpson.

Repairs.—The great rise and fall of tide at port Simpson permits a vessel to be beached. A good site will be found for this purpose just westward of the fort. The bottom consists of hard sand, with a covering of weeds.

See chart, No. 2426.

Tides and tidal streams.—It is high water, full and change, at port Simpson at 1h. 30m. ; springs rise 17 to 22 feet, neaps 14 to 17 feet.

Chatham sound has very little tidal stream, not more than one knot. A strong stream sets out of Nass and Work channels in Chatham sound and then flows out through Dixon entrance between Dundas islands and Alaska, at the rate of about $2\frac{1}{2}$ knots an hour.

Deviation.—For swinging to ascertain the deviation of the compass in port Simpson, Table hill on Dundas island 12 miles distant is conspicuous. The bearing of the nob at the north end of Table hill, from the anchorage in port Simpson, is N. $76^{\circ} 00'$ W. (true).

Parkin islands are two lying close together, about one cable in extent N.W. and S.E. ; though small, they are 250 feet high, wooded and conspicuous. The south extreme of Parkin islands lies about $1\frac{1}{2}$ miles N.W. $\frac{1}{2}$ N. from the north extreme of Birnie island, and 6 cables from the nearest shore (Black point).

Maskelyne point, the south-west entrance point of Portland inlet, and the north-west entrance point of Work channel, lies 3 miles S.E. $\frac{1}{3}$ S. from Wales point.

Maskelyne point is situated in latitude $54^{\circ} 38' 30''$ N., longitude $130^{\circ} 27' 0''$ W.

Work channel, the entrance to which lies close northward of Maskelyne point, takes a south-easterly direction for about 30 miles : about 8 miles from the head it divides into two arms, one branching northward for 3 miles, and the other arm south-east and east for 8 miles, and approaching within 2 or 3 miles of Skeena river. Its shores are bold and compact, and surrounded by high, precipitous mountains.

Trail bay is situated on the western shore 9 miles from the entrance of the channel, and Trail Bay cove on the west side of the bay, is small, and has good anchorage in 9 fathoms.

Two miles eastward of Grace point, a rock just visible at low water lies in the centre of the channel. It is described as having a very small top with a depth of 130 fathoms close to it.

There is indifferent anchorage at the head of the main inlet in 35 fathoms, two cables from low water mark.

The tidal streams at the entrance of Work channel run about 3 knots.

WEST SHORE OF CHATHAM SOUND.

PRESCOTT and STEPHENS islands lie in the south-western part of Chatham sound, and are separated by a narrow passage available only for boats. These islands together are about 12 miles long W. by N. and E. by S. Prescott island has an elevation of 820 feet.*

Stephens (Skiakl) island attains an elevation of 1,340 feet near its east end; its southern shores are comparatively low, with some white cliffs near the centre; about one mile westward of these cliffs there is reported to be a well sheltered anchorage in 9 fathoms named Thistle harbour.

Tree-nob groups are a mass of islands, islets, and rocks awash at low water, which extend 6 miles in a north westerly direction from the N.W. side of Stephens island. The larger islets are wooded, and the smaller bare. Vancouver, who nearly met with disaster among them, describes them as "an intricate inhospitable labyrinth."

EDYE PASSAGE on the south side of Prescott and Stephens islands, is the channel usually taken when communicating between Chatham sound and Hecate strait, as, by using it, vessels avoid the strong and irregular tides met with in Brown passage. It is comparatively free from danger, and at its northern end possesses an excellent anchorage (Refuge bay), in which a vessel may await a favourable opportunity for proceeding.*

Cape Ibbetson, the south-west point of entrance of Ede passage, is situated in latitude $54^{\circ} 2' 30''$ N., longitude $130^{\circ} 42' 45''$ W.

Porcher island.—Approaching Ede passage from the southward, Oval hill, 630 feet high, near the western extreme of Porcher island is conspicuous, and at 2 miles northward of that hill lies Flat hill, 170 feet high. At 3 miles southward of the latter, the western shore of Porcher island terminates in high white cliffs.

The south-western side of Porcher peninsula has several rocks awash, and sunken rocks extending one mile off it in a westerly direction.

* See Admiralty plan :—Brown and Ede passages Nos. 2,453 ; scale, $m = 1$ inch.

Bass rock, 30 feet high, situated close to the shore of Porcher island under Oval hill, is small, and bare.

A rocky ledge, with depths of 4 to 8 fathoms upon it, extends westward nearly 4 miles from the south-west side of Porcher peninsula, in the vicinity of the Bass rock.

The conspicuous white cliffs on the south side of Stephens island should not be brought to bear westward of North when approaching the western shore of Porcher island.

Goschen island, on the northern part of which is situated Rubble mountain, 1,400 feet high, is separated from Porcher peninsula by Freeman pass, narrow and intricate, having many rocks, showing only at low water.

Seal rocks, a cluster of bare rocks of small extent, 10 feet above high water, the centre of which lies 5 miles N.W. by W. $\frac{3}{4}$ W. from the summit of Oval hill, and 4 miles S.S.W. $\frac{1}{4}$ W. from cape Ibbetson (south-west entrance point of Edye passage), have depths of 12 to 31 fathoms at 2 cables from them.

Caution.—No vessel should pass between Seal and Warrior rocks; the passage is dangerous.

Warrior rocks, two bare rocks 30 feet above high water, lie E. by S., and W. by N., distant 8 cables from each other. The eastern rock lies $3\frac{3}{4}$ miles N.W. $\frac{1}{2}$ W. from the centre of the Seal rock cluster.

Wallace rock, marked by kelp and with a depth of 8 feet on it at low water springs, lies with Seal rocks bearing E. by S., distant $1\frac{1}{2}$ miles; and eastern Warrior rock N.N.W. $\frac{3}{4}$ W.

Deep patch, situated at the western entrance of Edye passage, is stated to have 19 fathoms upon it; there is, however, probably less water on this patch, as kelp was observed growing upon it in August.

The patch is of small extent, and lies one mile N.N.E. from cape Ibbetson. The south extreme of Arthur island (View point) seen in line with the south-east extreme of that island bearing E. by N. $\frac{3}{4}$ N., will lead northward of Deep patch. Foul ground extends off the south-eastern side of Arthur island to the distance of 3 cables.

Truscott patch, with 16 feet water on it, lies $1\frac{3}{4}$ miles E.N.E. from cape Ibbetson, and 6 cables from the nearest shore of Henry island.

Tidal streams.—The flood stream approaches from the westward, and both streams set fairly through E dye passage with an average rate of 2 knots an hour.

REFUGE BAY, situated at the north-west extreme of Porcher island, at the north entrance of E dye passage, is an excellent stopping place during south-easterly winds, or if desirous of proceeding to sea from Chatham sound by the E dye passage, the state of the weather in Hecate strait can be ascertained. The bay is 7 cables wide between its entrance points, and takes a south-easterly direction for about one mile, terminating in a sand-flat which extends nearly half a mile from its head.*

The depths in the middle of the bay are from 14 to 23 fathoms, sand, shoaling gradually towards either shore.

Anchorage will be found in 12 to 14 fathoms, sand and mud, near the middle of the bay, about 2 cables from the north and south shores, with the north entrance point (Table point) bearing N.N.W., and Pearce point bearing W. by S. $\frac{1}{2}$ S.

Tides.—It is high water, full and change, in Refuge bay at 1h. 30m. ; springs rise 17 to 22, neaps 14 to 17 feet.

BROWN PASSAGE, between Tree nob islands and South Dundas islands, is about 5 miles long E. by N. and W. by S., and 5 miles wide. Nearly in mid-channel, however, lies a cluster of rocks, awash at high water, which divides Brown passage into two channels.

Butterworth rocks are a dangerous cluster of rocks, the southernmost of which is 10 feet above high water, with several patches which uncover at low water extending three-quarters of a mile N.W. from it. This rock lies $3\frac{1}{2}$ miles S.S.W. $\frac{1}{2}$ W. from Bare island, the south-western island of the Tree nob group; with that island in line with some wooded islands forming the north west cluster of Tree nob group (Osborne islands).

There is deep water between Butterworth rocks and Tree nob islands.

* See Admiralty plan :—Refuge bay, on sheet No. 2,453 ; scale, $m = 4$ inches

Stenhouse shoal, a dangerous patch with 7 feet least water upon it, and reported to be 50 yards in extent, lies at the western entrance of Brown passage, $6\frac{1}{2}$ miles S.W. by W. from Cape islet, the south extreme of South Dundas island.

North breaker, over which the sea usually breaks, is the outer known danger extending north-west from the Tree nob group, and lies one mile W.N.W. from the outer Osborne island.

Hanmer rock (*Lachschatada*), a dangerous rock, nearly in mid-channel, $2\frac{1}{2}$ miles N. by E. from the outer Osborne island, and $2\frac{1}{2}$ miles S. $\frac{3}{4}$ W. from Cape islet, is awash at high water, with depths of 12 and 32 fathoms close to; there are several patches which uncover, extending from Hanmer rock W.N.W. three-quarters of a mile.

Simpson rock, lies on the north side of Brown passage, three-quarters of a mile S. by W. from Cape islet; this rock is 6 feet above high water, with rocks awash extending half a mile westward, and a depth of 17 fathoms at 4 cables southward of it; there is a patch which uncovers 3 feet at low water, at 3 cables S.E. of Simpson rock.

Beaver rock, with 12 feet water on it, lies $1\frac{1}{4}$ miles S.S.E. from the S.E. extreme of South Dundas island (Deans point); several patches of rock lie between Beaver rock and the shore of South Dundas island.

Directions.—Brown passage is not recommended to a stranger, but should circumstances compel him to make use of it, the eastern peak of the four-peak range, on South Dundas islands, should be steered for, bearing N.E. by N., until the eastern and highest Lucy island bears E.N.E., which will lead through Brown passage south of Hanmer rock, or bearing E. $\frac{3}{4}$ N. will lead through, northward of this rock.

Tidal streams.—In Brown passage the tidal streams set fairly through at an average rate of 2 knots an hour. The flood stream sets to the eastward, and off the western entrance to this passage the streams are strong and complicated.

QLAWDZEET ANCHORAGE lies on the north-west side of Stephens island, and it was into this bay Vancouver was conducted

by the officer of the *Butterworth* from his dangerous position amidst the Tree nob group. Qlawdzeet is exposed to the N.W., is three quarters of a mile wide at its entrance, and one mile deep in a southerly direction.*

Entrance reef, awash at high water, lies 2 cables N.W. from the eastern entrance point of Qlawdzeet bay.

Directions.—The entrance to Qlawdzeet bay will be made if the north extreme of Tugwell island is kept in line (astern) with the eastern island of the Lucy group, bearing N.N.E. $\frac{1}{2}$ E.

Keep in mid-channel when entering, and anchor at 3 cables within the bay and $1\frac{1}{2}$ cables off the south shore, in 12 to 14 fathoms, mud bottom, with the eastern entrance point of the bay bearing N.E. $\frac{1}{2}$ N., distant 4 cables, and the western entrance point bearing W. by N. $\frac{1}{2}$ N., distant 6 cables.

Tides.—It is high water, full and change, at Qlawdzeet anchorage at 1h. 30m.; springs rise 17 to 22, neaps 14 to 17 feet.

Bay islands, on the south side of South Dundas island, are reported to afford anchorage off their north-west side. The "*Butterworth*," however, "on coming out struck upon a rock which seemed to be a small pinnacle by itself as no soundings were gained near it."

The examination of this locality has shown the existence of many sunken rocks, the anchorage under Bay islands should therefore not be attempted.

DUNDAS ISLANDS, on the western side of Chatham sound, were so named by Vancouver; they consist of three islands, the northernmost being the largest and highest. A number of smaller islands (Moffat islands) lie close to the eastern coast of South and Middle Dundas islands. The western coast of the group have not been thoroughly examined but they are much broken into bays and inlets, with several small off-lying islets.†

South Dundas island is about 3 miles long, N.W. and S.E., and 5 miles broad, its coast being comparatively low, wooded, and broken into bays on the south and western sides. Near the middle of the island a mountain range rises 1,400 feet, with four conspicuous peaks which lie N.E. and S.W.

*See Admiralty plan:—Qlawdzeet anchorage, on sheet No. 2453; scale, $m = 4.0$ inches.

† See chart, No. 1,923a.

Middle Dundas island lies about 2 miles N.W. of South Dundas island, the passage between being obstructed by numerous low, wooded islets, rocks, and sunken dangers. The island is nearly 5 miles long N.W. and S.E., with a greatest breadth of 5 miles; it is mostly low and wooded, with numerous creeks and bays on its shores. Near the southern end of the island the land suddenly rises in an oval-shaped hill (Coast mound) 750 feet high, which is an useful landmark.

Connel islands, a group of small wooded islands, lie off the western side of Middle Dundas island. The outer or south-western island of the group lies off the entrance to the passage between South and Middle Dundas islands, about 2 miles from the western coast of the latter, and 7 miles N.W. from Osborne islands.

North Dundas island is about 12 miles long, North and South, and about 7 miles broad near its north end. This island, the highest and largest of the group, culminates in a mountain with a thumb-shaped summit, 2,500 feet high, about 4 miles from the south end of the island. Near the north extreme of North Dundas island there is a hill 700 feet high, with a flat top, and a nob near its north end (Table hill), a most conspicuous and useful mark.

The eastern coast of North Dundas island is but little broken; bold, with a range of hills about 300 feet high, rising immediately above it. On the northern side, nearly midway between Whitley point and White islands there is a deep bay, though useless as an anchorage, at the entrance to which lies a group of small wooded islets (Gnarled islands). Off the north-west extreme of the island, close to, are two conspicuous rocks (White rocks).

The western coast of North Dundas island has not been examined in detail. Several islands were, however, seen lying off that shore to the distance of 2 miles.

Captain Brundige put into a small harbour on the north end of North Dundas island. He says, "I found a small river there which extended 5 miles or more into the island."

ZAYAS ISLAND is the largest of the islands which lie off the western coast of North Dundas island. The extent of this island has not been ascertained, but it appeared to be about 4 miles long, in a north and south direction, and about 2 miles broad, wooded, and about 250 feet high. A ledge of rocks, which uncover at low water

was observed to extend nearly one mile from the north-west extreme of Zayas island. From the west side of the island, rocks are said to extend 3 miles.

Zayas island appeared flat and heavily timbered and probably 3 or 4 miles in extent.

It has been reported that an uncovering rock lies in mid-channel between Zayas and North Dundas island, two more rocks rather close in on north side of Zayas, and three small islets less than one mile from its north-west extreme (probably White islets of the chart). Besides these, dangers (presumably sunken) are shown as lying 3 miles west from north-west point of North Dundas, and 2 miles north from the north-west extreme of Zayas.

Channel islands are a group of wooded islands, about 100 feet high, extending across the channel between Middle and North Dundas islands. This group renders that channel useless for any but the smallest class of vessel. The passage, however, is frequently used by the Hydah Indians, in their large canoes, when proceeding from Queen Charlotte islands to port Simpson.

Moffatt islands consist of six principal wooded islands and several lesser ones, the highest being about 250 feet in height. This group, which lies close to the eastern coast of the Dundas islands, extends 6 miles N.W. and S.E. When abreast, these islands show out well, being covered with pine trees of a peculiar deep green foliage.

Ducie island is a small wooded islet, 350 feet high, lying one mile N.W. from the Moffatt group. Two conspicuous white rocks, 30 feet high, lie 3 cables northward of Ducie island.

Whitesand islet is a small sandy islet, about 10 feet above high water, lying 6 cables N.E. by E. from Ducie island. A ledge of rocks, which uncover, extends 4 cables N.W. and S.E. from Whitesand islet.

Hammond rock, of small extent, with 9 feet water over it, lies 9 cables E.N.E. from the south-eastern extreme of the S.E. Moffatt island. This rock has 34 fathoms close northward of it.

Coghlan rock, with 3 feet water, and 6 and 7 fathoms close around, lies 2 miles N.W. $\frac{1}{4}$ N. from Hammond rock, and $3\frac{1}{2}$ miles N.E. by E. $\frac{1}{4}$ E. from the summit of Coast mound. There are depths

of 43 and 46 fathoms, mud bottom, at one mile northward of this rock.

Brodie rock lies $3\frac{3}{4}$ miles N.W. from Coghlan rock. This dangerous pinnacle rock has only 3 feet water over it at low water, with depths of 26 and 33 fathoms at a distance of 100 feet.

The Rachel group of islands, kept open northward of the Lucy group, bearing S.E. $\frac{1}{2}$ S. will lead northward of the above-mentioned dangers; but during a fog, or in thick weather, the western shore of Chatham sound must not be approached under the depth of 40 fathoms.

Pointers rocks, are a dangerous cluster of bare rocks, 3 feet above high water, about 2 cables in extent in a north and south direction. The southernmost and highest rock lies 3 miles W.N.W. from the north extreme of Finlayson island and $2\frac{3}{4}$ miles W.S.W. from the north extreme of Birnie island.

Connis rocks consist of several small rocks, nearly in the middle of Main passage into Chatham sound, abreast port Simpson. The southernmost and highest rock, 15 feet above high water, is bare, and from it rocks extend 2 cables in a northerly direction. The summit of this rock lies 5 miles W.S.W. from the north extreme of Finlayson island, and $3\frac{3}{4}$ miles S.S.W. $\frac{3}{4}$ W. from Pointers rocks.

Vancouver remarks:—"These in the daytime and clear weather "are easily avoided, as there are always some of them above the "surface of the water; but in dark nights, or foggy weather, they "must render the navigation of the sound very dangerous."

Green islet, situated on the western shore of Chatham sound, about $1\frac{1}{2}$ miles from North Dundas island, is covered with long grass during the summer. It is small, 40 feet above high water, and has a small bare rock lying close northward, and another close southward. The middle and largest islet lies 3 miles S.W. by W. from Connis rocks.

Grey islet is a small bare rock, of a greyish colour, 30 feet above high water, 9 cables North from Green islet. A sunken rock, with 6 feet water on it, lies one mile W.N.W. from Grey islet, and another rock, with 4 feet water on it, lies 3 cables south from Grey islet, between it and Green islet.

MAIN PASSAGE, between Pointers and Connis rocks, is $3\frac{1}{2}$ miles wide, with depths of 92 fathoms, at one mile N.E. of

Connis rocks. Both Connis and Pointers rocks may be approached to a distance of half a mile.

ORIFLAMME PASSAGE lies westward of Connis rocks, between that cluster and Green and Grey islets. It is nearly 3 miles wide, with depths of 23 fathoms at 2 cables eastward of Green islet, and 65 and 70 fathoms, mud bottom, at 7 cables southward of Connis rocks.

The passage between Dundas island and the Green and Grey islets, is nearly $1\frac{1}{2}$ miles wide. The tidal streams in this passage are strong, and the channel is not recommended to a stranger.

Gnarled islands, a group of wooded islands, about one mile in extent east and west, lying off the north-west side of the North Dundas island, is from 150 to 250 feet in height; the eastern islet lies $2\frac{1}{4}$ miles W. $\frac{1}{2}$ N. from the N.E. extreme of the Dundas group.

The channel between Dundas and Gnarled islands is obstructed by ledges which uncover, and sunken rocks.

White islands are two bare rocks, about 30 feet high, lying half a mile from the north-west extreme of North Dundas island.

DIXON ENTRANCE is the channel between Prince of Wales and Queen Charlotte islands, passing northward of Dundas islands. Several sunken rocks, of doubtful position, are reported to lie in the western part of this passage, on or near a line joining the north end of the Dundas group and the south end of the Prince of Wales group.*

East Devil rock is situated about 4 miles north-westward of Zayas island, in latitude $54^{\circ} 40\frac{3}{4}'$ N., longitude $131^{\circ} 4' 30''$ W. East Devil rock is marked by a breaker, and is awash at low water.

West Devil rock dries 5 feet, and is in latitude $54^{\circ} 39' 30''$ N., longitude $131^{\circ} 36' 15''$ W.

North rock lies 5 cables N.N.E. $\frac{1}{2}$ E. from West Devil rock, with deep water around. Captain Carroll, commanding the steamer *Idaho*, 1883, reports that on April 13th of that year he sighted a breaker about 7 miles S.E. $\frac{3}{4}$ E. from cape Chacon, and that the Nuñez reef lies 6 miles S. by E. $\frac{1}{4}$ E. from the same cape.

McCullough rock on which the sea breaks is said to have been discovered by Captain McCullough. From it the north-west end of Zayas island bears N.E. $\frac{1}{2}$ E., and the southern end East, whilst the

* See Admiralty charts:—Queen Charlotte islands, No. 2,430; Port Simpson to Port McArthur, No. 2,458; scale, $m = 0.24$ of an inch.

western shore of Zayas island is distant about 3 miles in a S.E. $\frac{1}{2}$ E. direction.

A rock on which the sea breaks heavily lies about 8 miles N.W. by W. from the north-west point of North island, or in latitude $54^{\circ} 22' N.$, longitude $133^{\circ} 3' W.$, this position is considered doubtful.

Cape Fox, so named by Vancouver, lies about 7 miles N.N.W. from the Gnarled island group, and terminates in remarkable high, white cliffs, with a conspicuous saddle-shaped mountain (Harry Saddle), 2,066 feet high, immediately over it.

Lord islands, a group of about one mile in extent, lying $2\frac{1}{2}$ miles S.E. from cape Fox, is wooded and about 250 feet high; the south-west island is distant $5\frac{1}{4}$ miles from the outer or north-western island of the Gnarled island group.

Lord rock, which uncovers 3 feet at low water, lies 8 cables S.W. by S. from the south-west island of the Lord group. Fleece rock lies three-quarters of a mile south-eastward, and Thistle rock one mile N.W. by N. of the South-western Lord island.

Nakat inlet, has its entrance between cape Fox and Tongass island, and extends about 11 miles in a N.N.W. direction. Craig rock, with 9 feet over it, lies in mid-channel at the entrance 7 cables W. by S. $\frac{1}{2}$ S. from the west extreme of Tongass island.

In Nakat inlet, in the further bight inside the group of islands, is a well sheltered harbour with anchorage in less than 15 fathoms.

TONGASS ISLAND is about 3 miles eastward of cape Fox, and about 16 miles north-west of port Simpson, the settlement is dreary, and the almost constant rain and soft soil produces mud of a most tenacious nature.*

Anchorage.—The approaches to Tongass settlement are intricate and require local knowledge; the anchorage abreast the fort is bad, with deep water and limited accommodation even for a vessel of moderate length.

Directions.—The principal approach to Tongass is from the westward and is about half a mile wide. There are depths of 4 to 8 fathoms in this passage.

The approach from the south-east is about 3 miles long, and passing between numerous islets, is in places barely one cable wide. The depths in this passage are said to be from 5 to 16 fathoms.

See chart, No. 2,458.

* *See plan of Port Tongass; scale, $n = 1.5$ inches on chart No. 2,431.*

Tlekhonsity harbour (or Clement's city), is one of the south-eastern approaches to Tongass from Chatham sound. This passage is intricate and constricted.

Boston islands, lying off Wales island, at the south-eastern approach to Tongass, are about one mile in extent. The larger islands are wooded, about 150 feet high; the smaller ones are bare, 50 feet high. The western island is 450 feet high, round, wooded, and conspicuous. A ledge, which uncovers at low water, lies one mile E. by S. from the easternmost of the Boston islands, and one mile from the nearest shore of Wales island.

WALES ISLAND, situated on the north-west side of the entrance to Portland inlet, is about 7 miles long in an east and west direction, its north-eastern side being about 4 miles long. The north-eastern shore is bold, with some conspicuous cliffs of red-brown colour, nearly midway between the north and south extremes of the island. A small islet lies close to the shore at the north extreme. On the south side, about one mile westward of Wales point, the south-east extreme of Wales island, a deep bay faces south-eastward, and within it are some patches which uncover, and rocks awash. A wooded islet, about half a mile long, in a N.W. and S.E. direction, lies off the entrance to this bay, $1\frac{1}{2}$ miles S.W. $\frac{1}{2}$ W. from Wales point. A smaller islet lies one mile south-westward of the larger one.

Entry peak, about half a mile N.W. of Wales point, is 1,400 feet high, of triangular shape, with a sharp conspicuous summit. A mountain, with a flat summit, 1,100 feet high, is situated near the middle of Wales island.

Cod bank, with depths of 33 and 47 fathoms, mud and shells, lies between Pointers rocks and Parkin island, extending from the latter within the 50-fathom line, to the distance of $1\frac{1}{2}$ miles.

There is a depth of 109 fathoms, mud bottom, at 5 cables south, and 99 fathoms, rock, at 5 cables north of Cod bank. Codfish of large size are caught upon this bank.

Tidal streams.—The tides in Dixon entrance and Brown passage, especially in the western parts of those channels, are variable and complicated. The flood stream approaching from the southward up Hecate strait is met by the stream passing westward and northward

of Queen Charlotte islands at about 15 miles eastward of Rose point, or about midway between the north-east extreme of Queen Charlotte islands and the Tree nob group. Northward of that position this meeting of the streams produce tidal irregularities, and at spring tides or during bad weather the turmoil caused by the meeting of the streams is so great as to convey an appearance of broken waters to that portion of them which lies between Queen Charlotte islands, Brown passage, and Dixon entrance. In Chatham sound the tides set fairly through.

See chart, No. 2,430.

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CHAPTER XIII.

LAREDO SOUND TO OGDEN CHANNEL.

VARIATION in 1898.

Laredo sound, $25^{\circ} 45'$ E. | Ogden channel, $26^{\circ} 45'$ E.

LAREDO SOUND, between Price and Aristazable islands, is nearly 20 miles long N.N.W. and S.S.E., and from 3 to 14 miles wide. Kititsu hill, on the north-eastern shore of the sound, is a well defined summit 760 feet high. Over the north shore rise three remarkable mountains, North and South Needle peaks, 2,600 and 2,800 feet in height, and Cone mountain is 2,400 feet high.*

The eastern shore is low, wooded, and fringed by numerous islets, rocks awash, and sunken rocks, 2 miles from the west coast of Price island. At the western entrance of the sound a group of islands and islets extend from Aristazable island for more than 5 miles in a south-easterly direction.

Entrance island, 250 feet high, and three-quarters of a mile long N.W. and S.E., is the outer of a chain of islands lying off the south extreme of Aristazable island.

A bank of comparatively shoal water stretching across the mouth of Laredo sound, might serve to distinguish that sound, in thick or foggy weather, from Milbank sound, there being depths of over 120 fathoms at the entrance of the latter.

Nab rock, a dangerous sunken rock, over which the sea breaks only at long intervals, lies $3\frac{3}{4}$ miles S.E. by E. from the summit of Entrance island. The ground is foul for one mile S.E. from the rock, and several ledges uncover at low water between Nab rock and Entrance island.

* See Admiralty charts:—Cape Caution to port Simpson, southern portion, No. 1,923b; scale, $m = 0.25$ of an inch; also northern portion, No. 1,923a; scale, $m = 0.25$ of an inch.

Don point, situated on the western shore of Laredo sound, 4 miles N. by E., from the summit of Entrance island, is a peninsula 150 feet high, and when first seen, appears as an island. Close northward of Don point is a small cove, which affords shelter to boats.

Double island, on the eastern shore, is wooded, about 100 feet high, and divided near the centre by a cleft which causes it to appear as two islands, when seen from the southward and northward.

Low point, wooded and flat, lies $2\frac{1}{2}$ miles N.N.W. from the summit of Double island. Low rock, which uncovers at low water, lies 4 cables N.N.W. from Low point.

Schooner point is the turning point into Laredo channel, 7 miles N. by W. from Don point. Schooner ledge, which uncovers at low water, lies 3 cables northward of Schooner point.

South Bay islands, a group of small extent, lie at the head of Laredo sound. The larger islands are wooded, and 250 feet high. North Bay islands consist of three principal wooded islets of small extent, 250 feet high.

Steep point, high and bold, forming the north-east entrance point of Laredo channel, lies 2 miles N. by E. from Schooner point.

Directions.—Small sailing coasting vessels, to avoid the light winds and calms which frequently prevail in the inner channels, make use of Laredo sound and the channels leading northward from it, as the wind seldom fails them there. Pass one mile off Schooner point and proceed through Laredo channel as hereinafter directed.

LAREDO CHANNEL, between Princess Royal and Aristazable islands, is about 20 miles long in a general N.W. by W. and S.E. by E. direction, and from 2 to 5 miles wide. Fury point on the south shore, 4 miles N.W. by W. $\frac{1}{2}$ W. from Schooner point, terminates in black, smooth rocks. A small bay, with a sandy beach at its head, and an islet at its entrance, lies close eastward of Fury point.

Bluff point lies $7\frac{1}{2}$ miles N.W. by W. $\frac{1}{2}$ W., from Fury point; it is high and bold, with a hill 400 feet high rising immediately over it. On the north shore of Laredo channel, abreast Bluff point, is an islet at the mouth of a creek.

Beaver ledge uncovers at low water, and lies half a mile from the south shore, at $1\frac{2}{10}$ miles westward of Schooner point. There is deep water close northward of this ledge.

Islet rock lies close southward of a small islet on the north shore, at $1\frac{1}{2}$ miles westward of Steep point.

South Channel islands are five wooded islands, 150 feet high, and about one mile in extent, lying nearly in mid-channel, 6 miles from Schooner point. North Channel islands are two wooded islands of small extent. The eastern island of the group lies $1\frac{1}{2}$ miles N.W. by W. from the western island of the South Channel group.

Channel rock is a dangerous sunken rock, lying nearly in mid-channel, 6 cables S.E. by E. from the eastern islet of the South Channel group.

Seal rocks, which cover at high water, and are of small extent, lie half a mile from the south shore, 2 miles W.N.W. from Bluff point. There is deep water at two cables northward of Seal rocks.

Sandspit point, $5\frac{1}{2}$ miles N.W. by W. from Bluff point, is white and conspicuous, with a ridge of bare hills, 700 to 950 feet high, immediately over it. Sandspit shoal extends half a mile northward from Sandspit point.

Devils point, the western entrance point of Laredo channel, lies 4 miles W.N.W. from Sandspit point. Over this point is a bare hill with a conspicuous boulder or nob on its summit. Spray point, the north-east entrance point of Laredo channel, is bold, high, and lies 5 miles N.E. by E. $\frac{3}{4}$ E. from Devils point.

Directions.—Having rounded Schooner point at a distance of one mile, a N.W. by W. $\frac{3}{4}$ W. course for 6 miles should lead into Surge narrows, taking care, especially if the ebb stream be running, to avoid Channel rock.

Tides and tidal streams.—In the wider portions of Laredo channel both streams attain a velocity of 3 knots an hour at springs.

Midway between Devils and Spray points, the flood or north going stream from Laredo channel is met by the stream passing round the

north-west end of Aristazable island, causing at springs dangerous tidal races in that locality.

The ebb stream having divided in mid-channel off Devils point, one portion sets round the north-west end of Aristazable island. The other sets fairly down Laredo channel, and attains a velocity of 6 knots an hour, at springs, in Surge narrows. From Surge narrows the ebb stream sets directly towards Fury point, and thence sweeps along the southern shore of the channel, passing across Laredo sound to Low point, whence it is deflected and sets fairly to the southward.

Campania sound, between Princess Royal and Campania islands, is 5 miles long in a general N.N.E. and S.S.W. direction, and 3 miles wide.

On the eastern shore a conspicuous range of hills, with rounded summits, rise 900 feet, and ledges extend from it to a distance of half a mile. On the western shore, 3 cables from the south-east extremity of Campania island, lies Eclipse island, a small wooded islet, 100 feet high, and for one mile northward of Eclipse island ledges uncover to the distance of half a mile.

South Surf islands, situated at the south-east entrance of Campania sound, consist of three wooded islands 250 feet high, with several small rocky islets close to. North Surf islands, 250 feet high, lying three-quarters of a mile W. by N. $\frac{1}{2}$ N. from South Surf islands, consist of three wooded islands one mile in extent N.N.W. and S.S.E.

SQUALLY CHANNEL, between Gil and Campania islands, is 10 miles long E.S.E. and W.N.W., and from $2\frac{1}{2}$ to $4\frac{1}{2}$ miles wide. Gil island, which forms the north side of Squally channel, is 15 miles long N.W. by N. and S.E. by S., and 6 miles broad. Turtle point, the north extreme of the island, is a peninsula, with small bays east and west of it. The south-east extreme of Gil island is wooded, flat, and low.

Mount Gil, near the north-east end of the island, attains the elevation of 3,000 feet, the summit being well defined, and always clad with snow on the north side.

Channel reef uncovers at low water, and extends half a mile from the south extreme of Gil island (Ledge point), and fringes the shore

of that island, at the same distance, for $1\frac{1}{2}$ miles north-westward of Ledge point.

Windy islets are a group of three, the outer of which lies half a mile from the south-west shore of Gil island, at 2 miles westward of Ledge point. Windy rock uncovers at low water, and lies half a mile E.S.E. from the outer or south Windy islet. There is a depth of 20 fathoms at one cable south of the rock.

Black rock, situated on the north shore of Squally channel at 2 cables from the south-west extreme of Gil island (Blackrock point), the turning point into Lewis passage, covers at high water, is small and nearly steep-to.

Violent squalls will often be experienced in Squally channel, descending from the high land of Campania island, when calms or light winds and smooth water will be found in Whale channel.

Lewis passage, between Gil and Fin islands, takes a northerly direction for 4 miles, thence a north-west direction for 4 miles into Wright sound, with an average width of $1\frac{1}{4}$ miles.

Fin island, 2 miles westward of Gil island, is 4 miles long in a north and south direction, with an average breadth of $1\frac{1}{2}$ miles. Plover point, the north extreme, has a bay close southward of it, with several islets lying off the entrance; the bay dries throughout at low water. Four bare rocky islets fringe the north shore of Fin island, at the distance of one cable. Fin rock, awash at high water, lies on the western shore of the channel, 2 cables from the south extreme of Fin island.

Cridge passage, between Fin and Farrant islands, is 3 miles long in an E.N.E. and W.S.W. direction, and one mile wide.

Farrant island, at the south-east entrance of Grenville channel, is 9 miles long W.N.W. and E.S.E., and from 4 to 6 miles broad. The land on the south side of Farrant island reaches an elevation of 1,700 feet.

Blossom point, the south extreme of the island, has a small islet lying close to, with a ledge extending one cable south-west from it. Block head, the eastern extreme, terminates in a high, bold, white cliff. The coast between Block head and Yolk point is broken into several bays; the largest lies close under the latter point, and has

See chart, No. 1,923a.

two patches of rock which uncover, lying 2 cables from the shore at its entrance.

Yolk point, the north-east extreme of the island, lies $3\frac{1}{2}$ miles W. by N. $\frac{1}{2}$ N. from the north extreme of Gil island, and 4 miles N.W. from Block head. Yolk point is smooth, bare, and rocky, and is nearly steep-to. Davenport point, the north extreme of Farrant island, lies 3 miles W.N.W from Yolk point.

Union passage (Matliksimtas), between Farrant and Pitt islands, enters Grenville channel about 4 miles westward of Yolk point. This passage has not been explored.

WHALE CHANNEL, between Princess Royal and Gil islands, is 12 miles long N.N.W. and S.S.E., and from 2 to 3 miles wide. Leading point, on the eastern shore, 5 miles southward of Holmes bay (*see* page 434), has immediately over it a conspicuous hill, 700 feet high. River bight, between Holmes bay and Leading point, is a deep indentation with a large river at its head. Maple point, on the western shore, abreast of Holmes bay, is comparatively low, and wooded, with many maple trees growing.

Shrub point, on the western shore, 5 miles southward of Maple point, is comparatively low, flat, and wooded. Camp islet, a small, conspicuous, wooded islet, lying 2 cables from the western shore, at 9 miles southward of Maple point, is connected with the eastern shore of Gil island at low water. South of Camp islet there is a comparatively deep bay, one mile wide at its entrance; but which at low water is blocked by a ledge of rocks which uncover. Molly point, on the western shore, one mile south-east of Camp islet, is the turning point of Whale channel into Campania sound.

Barnard cove, south-east of Trouble island, affords shelter to boats and small craft. Pass in mid-channel between Trouble island and the eastern shore of Whale channel, and anchor in 20 fathoms, mud, in the eastern part of the cove, at 2 cables from the eastern shore.

Passage island, situated at the junction of Whale channel and Campania sound, is 2 miles long in a north and south direction, and one mile broad. It is wooded, the tops of the trees being about 250 feet above high water. Off the south-east side of Passage island, a group of islets, rocks, and sunken dangers extend half a mile in a south-easterly direction.

The passages east and west of Passage island are deep, and 6 cables wide. On the eastern shore of the eastern channel, several rocky islands extend from one to 2 cables from the shore, off the entrance to a bay.

ESTEVAN SOUND, between Estevan and Campania islands, is about 15 miles long W.N.W. and E.S.E., and from $2\frac{1}{2}$ to 5 miles wide. At the south-east entrance are several islets and sunken rocks, nearly in mid-channel. To a stranger, therefore, Estevan sound cannot be recommended.

If, however, circumstances should necessitate its being made use of, a course should be steered to pass three-quarters of a mile northward of South Watcher islet. Thence a general course of W.N.W., cautiously, for 15 miles, should take a vessel into Nepean sound, keeping nearer the south shore of the channel, to avoid the dangerous ledges which extend one mile from the south side of Campania island.

CAMPANIA ISLAND is nearly 15 miles long W.N.W. and E.S.E. and from one mile to 4 miles broad. At one mile from its eastern extreme the island has an elevation of 1,000 feet, increasing westward, until it culminates in two bare mountains, with dome-shaped summits, 2,000 feet high. These mountains are of granite formation, and furnish an excellent landmark when seen from seaward. From their summits, which are 4 and 6 miles respectively from the eastern extreme of the island, the land slopes to the westward, the western end of Campania island being, comparatively, low and wooded. The north-east extreme terminates in a high, bold, white cliff.

The southern coast is low, wooded, and broken into bays and creeks, fringed by islets, rocks awash at high water, and at low water, to the distance of one mile.

The western coast is bold, and little broken. Marble rock, a small, white rock, 6 feet above high water, lies half a mile from it.

South Watcher is a small wooded islet, 100 feet high, lying nearly in mid-channel at the eastern entrance of Estevan sound, $3\frac{2}{10}$ miles S.W. $\frac{1}{2}$ W. from Eclipse island; ledges, which uncover at low water, extend from it N.W. and S.E. half a mile.

North Watcher islet, 60 feet high, is small, wooded and conspicuous; it lies $1\frac{8}{10}$ miles W. $\frac{3}{4}$ N. from South Watcher islet; ledges which uncover, and sunken dangers surround it to the distance of 8 cables.

Blinder rock, over which the sea breaks occasionally, lies one mile S.W. by W. from the summit of South Watcher islet, and a little more than one mile S.E. from North Watcher islet. Estevan ledge, which uncovers at low water, is one cable in extent, and lies 8 cables West from the summit of North Watcher islet.

Breaker point, the eastern extreme of Estevan island, is low and wooded; Don ledge, which uncovers at low water, extends 6 cables E.N.E. from the point. Breaker reef consists of three rocks awash, surrounded by sunken rocks over which the sea nearly always breaks; the outer rock lies $2\frac{1}{2}$ miles S.W. from Breaker point, and nearly $1\frac{1}{2}$ miles from the nearest part of Estevan island.

Trap rocks, some of which are awash at high water, extend 8 cables northward from the north extreme of Estevan island, and thence front the western end of the island at the distance of 2 to 6 cables.

Guano rocks, on the north shore of Estevan sound, consist of a cluster of three white rocks, lying one mile distant from the south side of Campania island at 6 miles westward of Eclipse island. The highest rock is 30 feet above high water, and the group is surrounded by rocks awash and sunken rocks to the distance of from 5 to 7 cables.

Between Guano rocks and Eclipse island, ledges which uncover at low water extend from 5 to 6 cables from the shore.

Marble rock, half a mile westward of the west extreme of Campania island, is a bare rock 6 feet above high water, small, white, and conspicuous; it is nearly steep-to on all sides.

NEPEAN SOUND, between Estevan sound and Principe channel, is about 7 miles long and 4 miles wide.

Otter channel, between Pitt island and Campania island, connects Nepean sound with Squally channel, and is about $3\frac{1}{2}$ miles

long, and from $3\frac{1}{2}$ miles at its western, to one mile wide at its eastern end. Steep point, the north-eastern entrance point of the channel, terminates in a high, bold, white cliff.

Otter passage leads south-westward from Nepean sound, between Estevan and Banks islands. This passage, though nearly $1\frac{1}{2}$ miles wide, is obstructed on its western shore by a group of islands, islets, and rocks (Block islets), which contract the navigable channel to barely 4 cables wide in places.

This narrow channel is rendered more dangerous by the strong tidal streams in it, the greater portion of the ebb stream finding its way out of Nepean sound by this passage, at the rate of more than 6 knots an hour at springs, which, meeting the ocean swell at the western entrance of this passage, produces a most turbulent breaking sea, dangerous to small vessels.

In no case should Otter passage be attempted, except at slack water and with local knowledge.

PRINCIPE CHANNEL, between Pitt and Banks islands, is about 42 miles long W.N.W. and E.S.E., and from 2 to 7 miles wide. The south shore of the channel is bold, with mountains from 1,200 to 1,700 feet rising over it. The north shore is much broken into bays, especially about midway, in two of which, ports Stephens and Canaveral, anchorage may be found.

Directions.—A mid-channel course should be kept when navigating Principe channel, until nearing Anger island, when the south shore should be closed to avoid the dangers which extend off that island.

Deer point, at 4 miles westward of Block islets, is a small peninsula on the south shore, which when first seen appears to be an islet. Gale point is prominent, bold and high, and lies 5 miles N.W. of Deer point. A remarkable bare mountain, 1,250 feet high, is situated close to the shore at 4 miles westward from Gale point. Despair point, at 11 miles westward of Gale point, is bold, and nearly steep-to. Headwind point lies $5\frac{1}{2}$ miles westward of Despair point, thence the coast is bold and unbroken. Deadman islet, a small wooded islet, lies close to the shore off the north-west extreme of Banks island, about 15 miles westward of Headwind point. End hill, an oval-shaped hill 450 feet high, lies close to the south shore of Principe channel at 2 miles eastward of Deadman islet.

Wolf point, the south-eastern entrance point of Principe channel, and the south point of Pitt island, is high, bold and conspicuous, with several small islets close-to.

Brodie rock, a dangerous sunken rock, lies one mile S.W. by W. $\frac{1}{2}$ W. from Wolf point. Between Brodie rock and the shore the ground is foul to 2 miles westward of Wolf point. There is a depth of 66 fathoms at 2 cables south of Brodie rock.

PORT STEPHENS, on the north shore, at about 8 miles within the eastern end of Principe channel, is 4 cables wide at its entrance.*

Guide islet, a small bare islet, lies one mile eastward of the port, with two small islets (the Sisters) lying midway between it and port Stephens.

Bluff point, 8 miles N.W. by W. $\frac{3}{4}$ W. from Wolf point, forms the western entrance point of port Stephens and terminates in a high white cliff. Oar point lies 6 miles W.N.W. from Bluff point, the coast between these points being bold and unbroken.

Directions.—Keep midway between the entrance points (Bluff and Centre points), and steer N. by E. for half a mile; thence N.E. for half a mile, keeping mid-channel. Haul gradually to the eastward as the harbour opens out, and anchor in mid-channel in about 12 fathoms.

Tides.—It is high water, full and change, at port Stephens at 0h. 30m.; springs rise 18 feet.

Canoe islet, a small bare islet, not unlike a canoe in appearance, when first seen, lies off the mouth of Mink Trap bay, at one mile N.W. by W. $\frac{1}{2}$ W. from Oar point. Green top islet, three-quarters of a mile N.W. by W. $\frac{1}{2}$ W., from Canoe islet, is small, with a patch of grass and shrub on its summit.

Mink Trap bay, about 8 miles westward of port Stephens, consists of two long narrow creeks, separated by a peninsula; this bay has deep water in it, but it is useless as an anchorage for other than small vessels and boats.

At the head of the eastern arm is an Indian village, to which a tribe of the Kitkatlah Indians resort in summer for salmon fishing.

See chart, No. 1,923a.

* *See Admiralty plan:—Port Stephens, on sheet No. 2,189; scale, m = 3.25 inches.*

Anger island, on the north shore, 5 miles westward of Oar point, is about 4 miles long and 2 miles broad; near its western end the island reaches an elevation of 730 feet. Trade and Storm islands are clusters of islets which extend from 5 cables to $1\frac{1}{2}$ miles from the south and eastern shores of Anger island.

The narrow channel between Anger and Pitt islands is intricate and dangerous, with numerous rocks awash at low water which in July were free from kelp. The passage is used during the salmon season by small steam-vessels collecting fish for the Skeena river canneries.

Wheeler islet is a small wooded islet, distant 5 miles W. $\frac{1}{4}$ N. from Foul point, the western extreme of Anger island. Cliff islets extend north-east of Wheeler islet to the entrance of Petrel channel. These islets are bare and rocky, with foul ground between them and the shore of McCauley island.

McCauley island is 17 miles long, 9 miles broad, wooded nearly throughout, and near its centre rises 1,160 feet. Almost midway, on its south side, a bare hill with a flat top, 400 feet high, lies close to the shore.

PORT CANAVERAL, near the south-east extreme of McCauley island, about 21 miles westward of port Stephen, is an inlet trending N.E. for about three-quarters of a mile with an average breadth of about 3 cables, and depths of 6 to 18 fathoms over it.*

Dixon island lies on the western side of the port, with several islands and islets lying 2 cables off its south and eastern sides.

Squall point, the south-east entrance point, is the termination of the spur from Hat hill, and is bold and conspicuous. Red point, on the north shore, opposite Squall point, has a cliff of red-brown colour over it.

Alarm rock, with 8 and 10 fathoms close-to, is a dangerous sunken rock lying nearly in mid-channel at the entrance to port Canaveral, at $1\frac{1}{2}$ cables W.N.W. from Squall point, and $2\frac{1}{2}$ cables from Red point.

Harbour bank, with 6 fathoms over it (probably less), lies $1\frac{1}{2}$ cables north-eastward from Alarm rock, and midway between Squall and Red points.

See chart, No. 1,923a.

* *See Admiralty plan:—Port Canaveral, on sheet No. 2,189; scale, m = 3.25 inches.*

Clown rock, on the western shore, dries 3 feet, and lies $2\frac{3}{4}$ cables S.E. by E. from Tonkin point, the south extreme of Dixon island, with foul ground between it and the shore.

Stephen rock, 3 feet above high water, lies on the western shore at $1\frac{1}{2}$ cables from Dixon island. The outer portion of Stephen rock which uncovers at low water, lies 2 cables S.E. $\frac{1}{2}$ E. from Dimple point, the north-east extreme of Dixon island.

Directions.—Entering port Canaveral, Dimple point may be steered for when in line with Stephen rock, bearing N.W. $\frac{3}{4}$ N., until the middle of Bush islet is in line with Tonkin point bearing W.S.W. A course N.E. by E. $\frac{1}{2}$ E. will lead to the anchorage in 14 to 15 fathoms, sandy bottom, at $1\frac{1}{2}$ cables S.E. of Red point.

Tides.—It is high water, full and change, in port Canaveral at Oh. 30m.; springs rise 18 feet.

Bush and Dark islets are small, wooded islets, which lie close south of McCauley island, off the entrance to port Canaveral, at 2 miles westward of Wheeler islet.

Petrel channel is an unexamined passage between Pitt and McCauley islands; its southern entrance is about 3 miles wide, thence the channel takes a north-west direction for nearly 5 miles, when it divides, one passage going northward, the other southward of Lofty island, and again joining at 2 miles eastward of Ogden channel. Noble mountain on Lofty island rises to a height of 2,874 feet.

Hankin ledges consist of rocks awash, and sunken dangers, which extend nearly one mile from Hankin point (south-west extreme of McCauley island).

Tidal streams.—In Principe channel the flood stream, setting to the north-west, approaches principally by Esteval sound, being joined in Nepean sound by the stream which enters through Otter passage. At the western end of Principe channel this stream is met by the flood which has passed up outside Banks island.

The ebb stream runs out principally by the Otter passage. Both streams attain a velocity of 3 knots an hour at springs.

CHAPTER XIV.

OUTER COAST.—CAPE CALVERT TO OGDEN CHANNEL.

VARIATION in 1898.

Cape Calvert. $25^{\circ} 10' E.$ | Ogden channel, $26^{\circ} 45' E.$

CALVERT ISLAND, the southern island at the entrance to Fitz Hugh sound, is 13 miles long N.W. and S.E., and 8 miles across at its broadest part. The southern and western coasts of Calvert island are but little broken, comparatively low, and thickly wooded. Sorrow island, situated at the pitch of cape Calvert, the south extreme of Calvert island (*see* page 378), is conspicuous (and an excellent thick-weather mark) from its cliffy formation, and by being covered with stunted, weather-beaten trees.*

Mark nipple, an isolated hill, 350 feet high, at the south-west extreme of Calvert island, is a very useful landmark when approaching Fitz Hugh sound.

Position.—Cape Calvert, lat. $51^{\circ} 25' N.$, long. $127^{\circ} 55' W.$

Blakeney islet, 150 feet high, half a mile from the south-west extreme of Calvert island, is small, wooded, and about half a mile long.

Hedley patch, with 9 fathoms on it, and probably shoaler, is of small extent, and lies $3\frac{1}{2}$ miles S.E. $\frac{1}{2}$ E. from Blakeney islet.

Fitz Roy reef uncovers at low water, and is about a half a mile in extent in an east and west direction. Its outer or western edge lies $1\frac{1}{2}$ miles W. by N. from Blakeney islet, and $1\frac{1}{2}$ miles from the nearest shore of Calvert island.

Carrington reefs are a cluster of sunken rocks, the outer edge of which lies half a mile from the western coast of Calvert island, at $1\frac{1}{2}$ miles N.N.W. $\frac{3}{4}$ W. from Blakeney islet.

* *See* Admiralty charts :—Cape Caution to port Simpson, No. 1,923*b* ; scale, $m = 0.25$ of an inch ; also No. 1,923*a* ; scale, $m = 0.25$ of an inch.

The coast of Calvert island, northward of the Carrington reefs, is foul to the distance of 5 cables.

Kwakshua is an unexamined channel between Calvert and Hecate islands. At its western entrance this passage is half a mile wide, and takes a north-easterly direction. (See page 402.) Kwakshua rock lies nearly in mid-channel, at the western entrance of Kwakshua channel. The sea only breaks at intervals over this dangerous sunken rock. Hecate reefs fringe the western coast of Hecate island to the distance of 8 cables.

HAKAI CHANNEL, between Hecate and Nalau islands, is about 7 miles long N.E. $\frac{1}{2}$ N. and S.W. $\frac{1}{2}$ S., and from one to $1\frac{1}{2}$ miles wide. (See page 402.) Sugar-loaf hill, on the western side of Hecate island, is 500 feet high. Leading peak, about $1\frac{1}{2}$ miles southward of Sugar-loaf hill, has a sharp, well defined summit.

South Pointers are a cluster of bare black rocks, of small extent, 2 feet above high water, surrounded by sunken dangers to the distance of 2 cables; they lie on the south shore, at the western entrance of Hakai channel, $1\frac{1}{2}$ miles westward of the Starfish group. North Pointers are a cluster of bare rocks, of light colour, lying on the north shore at the western entrance of Hakai channel. The western or outer rock lies $2\frac{1}{2}$ miles N.N.W. from South Pointer rocks.

Breaker group, situated on the north shore in the middle of Hakai channel, is about one mile in extent, the larger islands being wooded, about 250 feet high, and the smaller bare. Breaker ledge uncovers at half ebb, and lies half a mile S.E. from the centre island of the Breaker group.

Directions.—Hakai channel is not recommended to a stranger. If using it, steer midway between North and South Pointers rocks, and thence a mid-channel course (N.E. $\frac{1}{4}$ N.) towards a conspicuous mountain on the eastern shore of Fitz Hugh sound, which will lead through into that sound.

STARFISH GROUP, wooded, from 70 to 150 feet high, lie on the south shore, and extend about $1\frac{1}{2}$ miles N.E. and S.W. The group consists of three principal islands, much broken into long, rocky, narrow creeks with shores of white cliffs. Starfish ledge, over which the sea usually breaks, lies 2 cables from the north-west shore of Long island, the northernmost of the Starfish group.*

See chart, No. 1,923*b*.

* See plan :—Welcome harbour No. 1,462; scale, $m = 4\cdot0$ inches.

East rock, off the entrance to Welcome harbour, is awash at low water, and lies half a mile off shore, N. by E. from the western entrance point. There are depths of 23 and 25 fathoms close to East rock, and 30 fathoms between that rock and Port reef, which latter is awash at high water, and lies 2 cables E. $\frac{1}{2}$ S. from East rock.

Leading peak seen in line with Bluff point bearing S. by E. $\frac{3}{4}$ E. will lead westward of these rocks.

Choked passage lies southward of the Starfish group; it is obstructed by rocks awash, reefs, and sandbanks.

WELCOME HARBOUR, situated on the south shore of Hakai channel near its western end, is 3 cables wide at its entrance, and $1\frac{1}{2}$ miles long in a S.S.E. direction. Though somewhat confined, it affords good shelter to small vessels, and within the harbour, on the north shore, there is a sandy beach where a vessel might be beached. Strong westerly winds send a swell into this harbour.*

Exposed bay, situated just eastward of Welcome harbour, has a dangerous cluster of sunken rocks near the middle of the bay.

Fairway rock, with 24 feet water over it, lies nearly in mid-channel at the entrance to Welcome harbour. There is a depth of 20 fathoms close westward, and of 9 fathoms close eastward of the rock.

Leading peak seen just eastward of Bluff point bearing S. by E. $\frac{3}{4}$ E. will lead eastward; and Sugar-loaf hill, seen in line with Leading island (a small, round, wooded island within the harbour), will lead close westward of Fairway rock.

Harbour ledge, situated one cable from the western shore of Harbour island, is of small extent, and dries 3 feet at low water. Codfish rock, with 12 feet water over it, lies 100 yards off the south shore of Harbour island. Wolf rock, awash at high water, lies close to the east shore, at nearly 2 cables northward of Sandspit point.

Directions.—Having passed not less than half a mile northward of Starfish group, the leading mark before given for clearing East rock should be brought on and steered for. Especial care will be necessary if the flood stream be making.

Having cleared East rock, pass east or west of Fairway rock as requisite, and anchor in 7 to 9 fathoms in mid-channel between Leading island and Wolf rock, with the former bearing W.N.W. distant one cable.

* See plan :—Welcome harbour, on Admiralty chart, No. 1,462; scale, $m = 4.0$ inches.

Tides.—It is high water, full and change, in Welcome harbour at noon; springs rise from 15 to 16 feet, neaps 12 to 13 feet.

The flood stream sets to the north-eastward. Both streams attain a velocity of 4 knots an hour at springs.

NALAU PASSAGE, between the Nalau group and Hunter island, is obstructed by islands, islets, rocks awash, and sunken dangers, and is useless for navigation.

White Cliff island, situated 4 miles W. by N. $\frac{1}{2}$ N., from the western or outer North Pointer rock, is of small extent, bare, and 250 feet in height; its coast, consisting of high white cliffs, renders it conspicuous when seen from the south and west.

A reef, on which the sea breaks at low-water, lies midway between White Cliff island and the North Pointers.

QUEEN'S SOUND, between Goose and Hunter islands, is about 12 miles long N. by E. and S. by W., and from 4 to 8 miles wide. At its northern end is a mass of islands and islets, which render that portion of the sound intricate and dangerous.

Spider island, 250 feet high, on the eastern entrance to Queen's sound, is $3\frac{1}{2}$ miles long, N.N.W. and S.S.E. and $1\frac{1}{2}$ miles broad; it is connected with Hunter island by a ledge of rocks awash, through which there are boat passages, and its north-west extreme terminates in high, bold, white cliffs.

Superstition point on the eastern shore of Queen's sound, 2 miles northward of Spider island, is the south-west extreme of a small island, which is connected with Hunter island by a narrow neck, awash at high water. Superstition ledge consists of high rocks, connected by rocks awash and sunken dangers, the outer extreme of which lies $1\frac{1}{2}$ miles S.W. from Superstition point. Strong tide races will be met with in the vicinity of this ledge, and the sea breaks upon it heavily at times.

Purple bluff, the south-west extreme of a group of islands, on the eastern shore of Queen's sound, at the entrance to Plumper channel, terminates in high, bold, basaltic cliffs of a purple tint. The group consists of numerous islands, islets (wooded and bare), rocks awash, and sunken rocks, extending over a space of nearly 5 miles.

Purple bluff lies 5 miles N.W. of Spider island, and 5 miles from the Goose island group.

Goose islands, on the western shore of Queen's sound, consist of four principal islands, connected at low water, the largest and northernmost being about 200 feet high, and wooded; its north-east extreme terminates in conspicuous, high, white cliffs. Yellocki, an Indian fishing village, is situated on the eastern side of the westernmost Goose island.

Gosling rocks consist of numerous rocks, awash at high water, and sunken dangers, the outer extreme of which lies nearly 4 miles S.S.E. from the southernmost Goose island. West rock, awash at high water, lies one mile S.W. of the westernmost Goose island.

Plumper channel, between Hunter and Campbell islands, leads from Queen's sound into Lama passage; its southern end is obstructed by numerous islets and rocks, and no specific directions can be given for entering it.

Hecate channel, between Campbell island and the Bardswell group, leads from Queen's sound into Seaforth channel, and is also obstructed at its southern end by numerous islets and rocks. The two principal passages are Codfish passage and Brown narrows; no directions, however, can be given for entering them.

BROKEN GROUP (Qual a qute), situated 2 miles northward of the Goose island group, extend 2 miles N.N.W. and S.S.E., and consist of several islets and rocks, connected throughout by ledges which uncover at low water. Fingal island (Kuhmkeate) is a small, wooded island, lying one mile W. by N. from the northernmost island of the Broken group. Fingal ledges extend one mile in a southerly direction from Fingal island, and consist of rocks awash, and ledges which uncover at low water. Peveril rock lies $1\frac{1}{2}$ miles N.N.E. from the northernmost Goose island, and is 8 feet high.

Middle rock, 6 feet high, lies 3 miles N.W. by W. $\frac{1}{2}$ W. from the north-west extreme of North Goose island. North breaker, a dangerous sunken rock, lies one mile N.N.W. from Middle rock. There is a depth of 27 fathoms, rock, at one mile westward of the North breaker.

Limit island (Tmaitlek) is a small wooded island, with foul ground extending half a mile south-west from it. Rempstone rocks consist of two patches awash at high water, one mile apart, lying E. by S. and W. by N. from each other. The western or outer rock lies $1\frac{3}{10}$ miles S.S.E. $\frac{1}{2}$ E. from cape Swain.

BARDSWELL GROUP, forming the eastern side of Milbank sound, consists of low, wooded islands, extending over a space of 7 miles square, the largest of which, Dufferin island, forms the west shore of Hecate channel. Among the group are several boat channels, communicating between Milbank sound, and Seaforth and Hecate channels.

Position.—Cape Swain, lat. $52^{\circ} 8' 50''$ N., long. $128^{\circ} 33' 30''$ W.

ARISTAZABLE ISLAND is about 26 miles long, N.W. and S.E., and is from one to 10 miles broad, and wooded. South range, at about 8 miles from its south-east extreme, is a conspicuous saddle-shaped hill 640 feet high. Near the western end of the island, over the north shore, North range, a bare ridge of hills, with four conspicuous peaks, rises to the height of 950 feet.

Over the south extreme of the island there are some bare hills 350 feet high, and at the extreme western end of the island there is a remarkable boulder or nob lying on the summit of a bare hill.

White rock, 100 feet high, bare and conspicuous, situated 5 miles N.W. by W. $\frac{3}{4}$ W. from Entrance island, is the outer rock of a group extending 2 miles from the shore of Aristazable island. Sentinel island, 250 feet high, small, round, wooded, and conspicuous, lies off the south point of Aristazable island, $1\frac{1}{2}$ miles from the shore, at 4 miles W. $\frac{1}{2}$ N. from White rock. Several rocks awash and sunken rocks lie north-westward of Sentinel island, and also fringing the south shore of Aristazable island.

GANDER ISLANDS (Cha che kwas), islets and rocks, extend 11 miles N.N.W. and S.S.E., and 4 miles broad, at about 6 miles from the south shore of Aristazable island. The larger islands of the group are wooded, the smaller ones bare, and the tops of the trees are from 70 to 150 feet above high water.

Large Gander island, the northernmost and largest of the group, is about 2 miles long N.N.W. and S.S.E., and half a mile broad. Middle

Gander islands are two small, wooded islands, lying close together, the northern island 5 miles S.S.E. from the south extreme of Large Gander island. A bare rock, with sunken rocks surrounding it, lies 2 miles N.W. by N. from the Middle Gander islands. South Gander island lies one mile S.S.E. from the Middle Gander islands, is $4\frac{1}{2}$ cables long N.N.W. and S.S.E., is half a cable broad, 70 feet high, and wooded. South-east Gander islands are two small wooded islands 100 feet high, lying close together, 3 miles S.E. by E. from South Gander island. Two small, bare, rocky islets lie $1\frac{1}{2}$ miles north-west of South-east Gander islands. Goose ledge, which uncovers at low water, lies 3 miles S. by W. $\frac{1}{2}$ W. from South-east Gander islands, and 3 miles S.E. $\frac{1}{2}$ E. from South Gander island.

Sparrowhawk breakers lie, respectively, 4 and $6\frac{1}{2}$ miles S. by E. from South-east Gander islands. There is a depth of 21 fathoms between these dangers.

Tide rip islands, 2 miles northward of the Gander group, extend 12 miles N.N.W. and S.S.E., are wooded, and about 200 feet high; the northern and largest island terminating at its north-west extreme, in high, white conspicuous cliffs, $2\frac{1}{2}$ miles westward of Devils point, the north-west point of Aristazable island.

Tidal streams.—The flood stream sets to the northward, both flood and ebb streams attaining at springs, among these islands, a rate of 4 knots an hour.

Caution.—An extended examination has not been made of the Gander and Tide rip groups and their vicinity, and the tidal streams are strong, the channels between them, though deep, should not be attempted by a stranger. When approaching these groups of islands, the lead and look-out should be especially attended to.

ESTEVAN ISLAND is about 14 miles long W. by N. and E. by S., and from 2 to 5 miles broad; the southern shores being comparatively low, wooded, and much broken into bays and creeks. Near the centre it attains an elevation of 1,500 to 1,700 feet, forming a saddle-shaped mountain with the highest part to the westward.*

Haycock island, small, bare, and 60 feet high, lies 7 miles W. by S. $\frac{3}{4}$ S. from Breaker point, the eastern extreme of Estevan island. Haycock rocks are three rocks awash, which lie respectively W. by S., S. by E., and N. by E. distant one mile from Haycock island.

* See chart, No. 1,923a.

The passage between Haycock island and Estevan island should not be attempted.

Curtis point, on the south shore of Estevan island, $4\frac{1}{2}$ miles N.W. $\frac{1}{2}$ W. from the summit of Haycock island, is low and wooded, with some rocky islets close to. Curtis rock, a dangerous sunken rock, over which the sea breaks occasionally, lies one mile S.S.W. from Curtis point.

Cox point, is the west extreme of Estevan island. Marchant rock, over which the sea breaks at low water, lies 2 miles South from Cox point, and $1\frac{1}{4}$ miles from the nearest coast of Estevan island.

Cone islet, small, wooded, 250 feet high, and conical, is the southernmost of the Block islets, and lies at the southern entrance of Otter passage, and on the west side of that channel, at 2 miles from the coast of Banks island.

Breaker islets, which lie off the eastern end of Banks island, at one mile westward of Cone islet, consist of a group of islets and rocks awash, the highest islet being about 70 feet high and wooded.

BANKS ISLAND is about 41 miles long, W. by N. and E. by S., and from 5 to 10 miles broad. The southern coast is wooded and comparatively low, seldom exceeding 150 feet in height, and is broken into bays and creeks, rendered useless as anchorages by numerous rocks awash, and sunken dangers.

Calamity bay, at the eastern extreme of Banks island, is 3 miles wide at its entrance, and extends 3 miles in a north-westerly direction ; it consists of iron-bound shores, with rocky islets and sunken dangers occupying the bay nearly throughout.

Terror point, the south-east extreme of Banks island, is high and bold, 200 feet above high water. From its outer extreme this point slopes inland, and when first seen appears as an island. Terror rocks consist of rocks awash and sunken rocks, over which the sea breaks heavily, extending one mile south-eastward from Terror point.

Shrub islet, of small extent, 80 feet high, with a conspicuous patch of bush upon its summit, lies 3 miles S.W. $\frac{1}{2}$ W. from Terror point, and has sunken rocks surrounding it to the distance of 3 cables.

Grief point, 8 miles N.W. by W. $\frac{1}{2}$ W. from Terror point, is low and wooded. A ledge, consisting of rocks awash and sunken

dangers, extends $1\frac{1}{2}$ miles S.W. from Grief point. Foul bay, between Grief and Wreck points, is 5 miles wide, and 2 miles deep; it is, however, useless as an anchorage, being obstructed by islets, rocks, and sunken dangers. Junk ledge, consisting of rocks awash, and ledges which uncover at low water, extends nearly 2 miles S.E. from Wreck point.

North Danger rocks, 7 miles southward of Wreck point, are a dangerous cluster of five bare rocks of small extent, 10 feet above high water, and surrounded by rocks awash and sunken rocks for half a mile. The centre of the cluster lies 18 miles S.E. by E. $\frac{1}{2}$ E. from the summit of Bonila island.

Vessels should keep southward of the line joining Shrub islet and North Danger rocks, and not pass between those dangers and Banks island.

Halibut rocks consist of two dangerous clusters (covered at high water) about half a mile each in extent, lying W.N.W. and E.S.E., distant $1\frac{1}{2}$ miles from each other. The centre of the eastern cluster lies 8 miles E. by S. $\frac{3}{4}$ S. from the summit of Bonila island, and $4\frac{3}{4}$ miles S.E. by S. from Cliff point.

Cliff point, 6 miles W. $\frac{3}{4}$ N. from Kelp point, terminates in high, bold, white cliffs. Three small rocky islets lie near the shore close eastward of the point.

South rocks consist of two clusters of rocks awash at high water, of small extent, lying S.S.E. and N.N.W., distant one mile from each other. The south or outer group, over which the sea usually breaks heavily, lies $3\frac{1}{2}$ miles S.S.E. from the summit of Bonila island. High-water rocks, lying nearly midway between Bonila island and Cliff point, consists of six rocks, awash at high water, about 2 cables in extent, at $2\frac{1}{4}$ miles E. $\frac{1}{2}$ S. from the summit of Bonila island.

Bonila island, situated 9 miles S.S.E. from the north-west point of Banks island, and 4 miles from the south coast of the island, forms an excellent landmark. The island is about 2 miles long east and west, and one mile broad, having on its eastern shore two small bays, with some rocky islets lying off them at 2 cables from the shore. Near the centre the island reaches an elevation of 550 feet, the summit being dome-shaped, falling almost perpendicularly on its north and south sides, but sloping gradually to the westward.

See chart, No. 1,923a.

During the summer months, the sides of Bonila peak are clothed with purple-tinted heather. Landing may be effected at the head of the southern small bay on the eastern side of Bonila island.

Position.—The summit of Bonila island is situated in latitude $53^{\circ} 28' 40''$ N., longitude $130^{\circ} 35' 15''$ W.

North-west rocks are a cluster, half a mile in extent, lying 2 miles N.W. by W. from the summit of Bonila island; the highest rock is 3 feet above high water. North rocks, a cluster, about half a mile in extent, and awash at high water, lie $1\frac{1}{2}$ miles E.N.E. from the centre of the North-west rocks, and 2 miles N.N.W. from the summit of Bonila island. Middle rocks, two clusters, awash at low water, lie respectively $1\frac{1}{2}$ miles W.N.W. and 2 miles N.N.E. from the summit of Bonila island.

White rocks lie close to the shore at the western extreme of Banks island: the two largest rocks are about 30 feet above high water, bare and conspicuous, with several smaller rocks surrounding them, and they form an excellent landmark when making Ogden channel from Hecate strait. Anchorage for small craft in fine weather is stated to be obtainable close northward of White rocks at the mouth of a creek. There is also anchorage reported to exist generally off the north-west coast of Banks island.

Supplies.—Game abounds on all the off-lying islands. Notwithstanding the presence of wolves, deer are in great numbers, especially on the southern shores, which appear to be their favourite resort. Water is plentiful at all seasons, the source apparently being springs. Trout may be procured in the streams.

Berries, especially the whortleberry, cranberry, and wild raspberry, have been found in abundance during July and August.

Cedar and pitch pine are the principal woods met with.

Browning entrance is the approach common to the south end of Ogden channel and the west end of Principe channel. It is included between the south side of Goschen island and the north-west extreme of Banks island, and between cape George and White rocks is 14 miles wide.

OGDEN CHANNEL, situated between Pitt and Porcher islands, is about 16 miles long, and from 4 cables to $1\frac{1}{2}$ miles wide, and

affords the shortest means of communication between Queen Charlotte islands (Skidegate) and the Inner waters. At its southern end, Ogden channel is divided by Spicer island into Schooner and Beaver passages; and at one mile northward of Spicer island the channel is obstructed by Channel islands, which reduce the navigable channel to 4 cables wide.*

On the eastern side of Dolphin island, close to the shore, Passage cone, 454 feet high, is an useful mark for indicating Schooner passage. On the north-west side of Spicer island a saddle-shaped hill rises 800 feet.

Spicer island, situated between McCauley and Dolphin islands, is 827 feet high. On its south-east side two small narrow bays indent the shore in a north-westerly direction; and off its south-west side, at half a mile from the shore, are Christie islands, a cluster of islets and rocks, some wooded and others bare. Long island consists of two low wooded islets, lying close together at $1\frac{1}{2}$ miles southward of Spicer island. Channel island is a small wooded islet, lying nearly midway between Long and Spicer islands.

Channel group lies one mile northward of Spicer island. The large islands are wooded, and the eastern islet of the group is small, bare, and conspicuous. Half a-mile northward of the Channel group are some small islets, one bare (White rock), and another covered with vegetation (False grassy islet).

South Twin islet is a small wooded islet on the eastern shore, half a mile from the eastern islet of the Channel group and one mile northward of Spicer island. This islet, and the eastern bare islet of the Channel group, indicate the navigable channel, which lies between them. North Twin islet, resembles South Twin islet from which it lies N.N.W., distant half a mile. The tops of the trees on North Twin islet are about 130 feet high.

Dolphin island.—There is an anchorage on the north-west side of Dolphin island, in the bay off Kitkatlah village, in 11 fathoms, with Village point bearing East, and the large white stone South. The channel between Dolphin and Goschen islands is rocky and dangerous, with strong tides, and should not be attempted.

BEAVER PASSAGE, between McCauley and Spicer islands, is the wider and better of the two passages leading into Ogden channel.

* See Admiralty chart :—Ogden channel and adjacent anchorages, No. 1,901; scale, $m = 1$ inch.

At its western entrance Beaver passage is about half a mile wide, and takes a N.N.E. $\frac{3}{4}$ E. direction for about $4\frac{1}{2}$ miles, thence turning sharply to the N.W. by W., towards the Channel group, for $2\frac{1}{2}$ miles.

North rock is always visible, and lies nearly in mid-channel at the southern entrance of Beaver passage, half a mile south-east from Long island.

Connis rock lies on the western shore (marked by kelp in the summer season) 3 cables from the north-east extreme of Spicer island. The outer of these rocks only covers at high water. The east side of Long island touching the west side of Channel island bearing S.S.W. $\frac{3}{4}$ W. leads eastward of Connis rock.

On the eastern shore, abreast Connis rock, is a small cone-shaped wooded islet off a sandy bay.

SCHOONER PASSAGE, between Spicer and Dolphin islands, is barely 2 cables wide in its narrowest part, and is about 3 miles long north and south.

Boys rock, a dangerous sunken rock, lies at the southern end of Schooner passage, 2 cables from the south-east extreme of Dolphin island. There is a depth of 49 fathoms, rock, at 2 cables South of Boys rock.

Tidal streams.—The flood stream sets to the northward, and near the north end of Ogden channel divides, one part turning eastward into Grenville channel, the other continuing northward towards Skeena river. The ebb stream from Grenville channel, Chatham sound, and Skeena river, unite off the north end of Ogden channel, and pass out by it. The muddy water of Skeena river is usually distinguished against the blue water of Ogden channel.

Both flood and ebb streams, in the narrow portions of Ogden channel, attain a velocity of 4 knots an hour at springs.

ALPHA BAY, situated on the eastern shore, 4 miles within the north entrance of Ogden channel, faces the west, and is nearly one mile wide, but only 3 cables deep. Near its northern end a deep valley extends inland, and through it flows a fine trout stream. From the south entrance point of this stream a sandspit extends 2 cables towards the north point of Alpha bay.*

* See Admiralty plan :—Alpha bay, on Admiralty chart, No. 1,901 ; scale, $m = 6\cdot0$ inches.

Anchorage may be obtained in 10 and 11 fathoms, at $1\frac{1}{2}$ cables from the nearest shore (Fish point), with the south entrance point of the trout stream bearing N.E. distant $2\frac{1}{2}$ cables, and Anchor mountain over the north shore of the bay N.E. $\frac{1}{2}$ N.; in this position the point on the western shore under Bareside mountain should be seen in line with north point of Alpha bay, bearing N. by W. $\frac{3}{4}$ W.

Tides.—It is high water, full and change, in Alpha bay at noon; springs rise 18 to 19 feet.

Peninsula point, the north-west entrance point of Ogden channel, is prominent, with a hill near its eastern extreme. Northward of the point, at the mouth of the river Oona, is Oona bay, about half a mile wide, and one mile deep in a westerly direction.

There is said to be anchorage in 8 or 10 fathoms water on the north side of Peninsula point, near the mouth of the river Oona.

See chart, No. 1,901.

CHAPTER XV.

PORTLAND AND OBSERVATORY INLETS AND
PORTLAND CANAL.

.....
 VARIATION, $27\frac{1}{2}^{\circ}$ East in 1898.

PORTLAND INLET extends from Chatham sound N. by E. $\frac{1}{2}$ E. for 10 miles, where it divides, one arm continuing northward to the head of Observatory inlet and the other to the head of Portland canal. At its southern entrance, between Wales and Maskelyne points, the inlet is about 3 miles wide, and its shores are comparatively free from danger beyond the distance of 2 cables.*

Compton island, at the north entrance of Work channel, is of triangular shape, with a base 2 miles long to the southward, the northern extreme of the island terminating in a long, low point. There is a boat passage into Work channel eastward of Compton island.

Emma passage, northward of Compton island, is half a mile wide, and takes an E.S.E. direction for 3 miles, thence N.N.E. 3 miles, and terminating in a sandy bay. The depths throughout the latter arm are from 23 to 36 fathoms. Union bay, at the head of the south-east arm, affords anchorage for small vessels in 20 fathoms at one cable from either shore.

Somerville island, 2,000 feet high, on the eastern side of the inlet, is $8\frac{1}{2}$ miles long, N. by E. and S. by W., and 3 miles broad. The coast of this island is wooded, and bold, the land on its western side rising almost perpendicularly from the sea. Elliott point is the south extreme of Somerville island.

Truro island, 2 cables from the south-west side of Somerville island, is about $1\frac{1}{2}$ miles long N. by E. and S. by W., and nearly half a mile broad. The island is wooded, and culminates in two

* See Admiralty chart :—Port Simpson to Port McArthur, No. 2,458 ; scale, $m=0.24$ of an inch.

hills 800 feet high. Nob islet is a small, round, wooded islet, 30 feet high, lying close to the western shore of Somerville island, distant 8 cables from the north extreme of Truro island. There is a remarkable white cliff just southward of Nob islet. Start point, the north extreme of Somerville island, lies abreast Lizard point, $2\frac{3}{4}$ miles from it; it is high, and bold, with a deep bay close eastward of it.

Cliff point, 7 miles N. $\frac{3}{4}$ E. from Wales point, terminates in high cliffs. Immediately south of the point is a narrow creek, which extends some distance inland in a north-west direction. Lizard point is a prominent point on the western shore, 3 miles N.N.E. from Cliff point. There are sandy bays close north and south of this point, extending back a considerable distance, giving to Lizard point the shape of a peninsula, and when first seen from the westward it appears to be an island. At $2\frac{1}{2}$ miles northward of Lizard point there are some conspicuous red-brown earthy cliffs.

Flat point lies $5\frac{1}{4}$ miles N. $\frac{1}{4}$ E. from Lizard point. The shore between these points is wooded and comparatively low, and a similar conformation exists $1\frac{1}{2}$ miles northward of Flat point. Portland point, about 18 miles within the inlet, lies 3 miles North from Flat point, is high, bold, and nearly steep-to.

Ramsden point, which divides Observatory inlet from Portland canal, lies $2\frac{1}{4}$ miles N.N.E. from Portland point. A dangerous cluster of rocks (awash and sunken) extend a short distance south-east from Ramsden point.

Steamer passage, eastward of Somerville island, has an average width of half a mile, with depths of 28 and 40 or more fathoms water throughout. Khutzeymateen inlet is an unexamined arm, 5 miles within Steamer passage. It is half a mile wide at its entrance, and takes an E.N.E. direction. Quinamass bay, on the eastern side of Steamer passage, abreast the north end of Somerville island, is half a mile wide at its entrance, and takes an easterly direction. At low water it is almost completely filled by a sand-flat, rendering the bay useless as an anchorage.

Nasoga gulf, eastward of Mylor peninsula, extends in a north-easterly direction for 5 miles, is one mile wide, and terminates in comparatively high land. Anchorage will be found near the head of Nasoga gulf, in 10 to 12 fathoms, sand, in mid-channel, at 2 cables from the north shore.

Mylor peninsula is a high and comparatively narrow strip of land on the eastern side of Portland inlet, between Nasoga gulf and Nass bay. A small islet (Ranger islet) lies off its south extreme, and there the land is comparatively low (450 feet); but it rises quickly to the height of 2,900 feet, and forms high, bold, precipitous shores. Trefusis point, the south extreme of the peninsula, terminates in high white cliffs.

NASS BAY, on the east shore, lies at the mouth of Nass river. It is 2 miles wide at its entrance, the points of which lie north and south of each other, and the bay preserves this width in an easterly direction for 3 miles, where it divides, one branch taking a north-easterly direction to the mouth of Nass river, and the other a south-westerly direction, forming Iceberg bay.*

An extensive sand-flat occupies nearly the whole of the eastern portion of the bay at low water. Low point is wooded. On the south shore of the bay, half a mile eastward of Low point, is Landslip mountain, 2,042 feet high, with a bare side facing the north-west.

North point terminates in a bold cliff, and one mile eastward is Mission valley; at one mile back from the coast is mount Tomlinson, a conspicuous mountain, 3,385 feet high. Through the valley a large stream runs, dividing near its mouth into two branches. **Fort point**, the north-west entrance point of Nass river, terminates in white cliffs. And on the eastern side of the bay, some low, dark islands (Mud islands) will be seen.

Kincolith, a mission station situated east of the stream at the mouth of the valley, is fronted by a sand-flat (Canoe flat), which renders communication by boat, except at high water, almost impossible. There are two saw mills here, one owned and worked by Indians. Gold is found here in small quantities, and also coal. The temperature is very severe, the thermometer in some winters falling to from 40° to 50° below zero for weeks in succession.

Observation spot, at the east side of mission valley, is situated in latitude 54° 59' 26" N., longitude 129° 57' 36" W.

Anchorage, in fine weather, may be had off Kincolith, nearly in the middle of Nass bay, on the line joining the mission station and Landslip mountain, in 10 fathoms, mud bottom, at about 8 cables from the north shore; with the mission flagstaff seen in line with

* See Admiralty plan :—Nass bay, No. 2,190; scale, $\frac{1}{2}$ = 3 inches.

the centre of Mission valley, bearing N. by E. and Leading point (south side of Nass river) seen just open of Fort point (north-west entrance of Nass river), bearing N.E. by E. $\frac{1}{2}$ E.

Caution.—A strong ebb tide will be felt in this position, and care must be exercised in taking up a berth, as Canoe flat is very steep-to, and it is recommended to use the deep-sea lead in approaching it.

Tides.—It is high water, full and change, at Nass bay, at 1h. 5m.; springs rise 17 to 23 feet.

ICEBERG BAY, the south-west arm of Nass bay, is 3 miles long in a S.S.W. direction, and not less than 7 cables wide; the head of the bay, terminating in a low swampy flat, fronted by a sand-flat, is only 3 miles from the head of Nasoga gulf.

At the entrance of Iceberg bay the depth of 10 fathoms, and less, will be found; but as the head of the bay is approached the water will deepen to over 40 fathoms.

Anchorage may be obtained at the entrance to Iceberg bay, in 7 to 8 fathoms, mud, with the north-west entrance point of Nass bay (North point) seen in line with the north-west entrance point of Iceberg bay (Double islet point) bearing N.W. by W. $\frac{1}{4}$ W.; distant 6 cables from the latter.

NASS RIVER flows into the north-east corner of Nass bay, the mouth of the river being, however, obstructed by a sand-flat, which dries at low water, and extends towards Iceberg bay. Ripple tongue, the south-west extreme of this extensive flat, lies $2\frac{1}{2}$ cables North from Double islet point.

Within the river, the navigation is difficult and dangerous, the channel at low water being barely available for large canoes; local steamers, however, from Victoria, drawing 6 feet water, venture up, though they frequently run aground; it is recommended not to attempt the river until the strength of the flood tide has slackened. The channel is liable after freshets to change.

Nass river, at its entrance abreast Fort point, is $1\frac{1}{2}$ miles wide, whence its direction is E.N.E. for 7 miles, and N.N.E. for 7 miles, to abreast the Nass villages. The channel near the mouth of the river being tortuous, the distance by the channel from Fort point to the Nass villages is about 16 miles. The south, middle, and north

villages are known, respectively, by the names of Kit min i ook, Kit lah kum ka dah, and Kit a kauze. The river continues in a north-easterly direction for 25 miles beyond the lower Nass villages, and there divides, one branch taking a north-westerly direction. Kilawälaks, the head of canoe navigation, is situated on the north-west branch 40 miles from the lower Nass villages.

Tides.—The time of high water at the lower Nass villages is uncertain, depending apparently upon the freshets down the river. There was no slack at high water, the water beginning to fall immediately it has ceased to rise (August, 1868). At low water there was slack for one hour and a half. In the month of August the flood stream was not felt above the Middle bank, and from Indian report this is the case at all seasons.

Ice.—The river is reported to freeze over down to its mouth during severe winters.

Fish.—The Houlican, from which the nutritious oil is obtained, the principal sustenance of the Indians, are caught in great numbers during the spring, as also are salmon. For this purpose, numerous fishing weirs are erected along the banks of the river, especially on the south shore; and about 13 miles up, near Stony point, there is an establishment where the fish are salted down and shipped to Victoria.

OBSERVATORY INLET, northward of Nass bay, is called by the Indians Kit sah watl; in some parts the shores are low, and wooded, the land rising at a few miles back to 4,000 and 5,000 feet high. The low wooded shore has an undergrowth of thick moss, overlying rock, and saturated with moisture, which renders travelling difficult.*

Salmon cove (Kwinamelith) lies on the western shore, 19 miles from Ramsden point and 39 miles from Wales point.

Richard point, the north point of Salmon cove, is a long, wooded, conspicuous projection. From its north-east extreme the land trends in a south-westerly direction, for $1\frac{1}{4}$ miles, to the head of Salmon cove, which is barely 3 cables wide. A sand-flat extends 2 cables from the south shore at the entrance to Salmon cove.

* See chart, No. 2,458.

Anchorage was obtained by Vancouver in Salmon cove "in 31 and "35 fathoms water, muddy and small stony bottom. The points of "the cove bore by compass N.N.E. and S. by E."

Brooke island, $2\frac{3}{4}$ miles long and half a mile broad at its northern end, is low and wooded. The south extreme of this island lies 4 miles northward of Richard point, and 5 cables from the eastern shore. Several patches of rock, which uncover at low water, extend 5 cables northward from Brooke island (Lachjokiyeht).

Paddy passage is half a mile wide, between Brooke island and the eastern shore, but near its northern end it is barely 2 cables wide; it is reported unsafe and should not be used.

Frank point, situated 5 miles N. by W., from Richard point, and $1\frac{1}{2}$ miles from the western shore of Brooke island, is low, and wooded. Xschwan is the name of a salmon fishery which lies at the head of a small bay on the western shore, 4 miles northward of Frank point.

Larcom island, situated nearly in mid-channel, at the mouth of Hastings arm, is about 5 miles long, N.N.W. and S.S.E., with an average breadth of half a mile; its south extreme lying 6 cables N.W. from Brooke island. The island is flat, wooded, and comparatively low. At its south-west end, there is an extensive lagoon.

The channel westward of Larcom island is obstructed near the north end of that island by several islets and rocks, and is only available for boats.

Hastings arm passes eastward of Larcom island, and takes a general N.W. $\frac{1}{2}$ N. direction for 4 miles, thence westward for about one mile, and N.W. by N. for 9 miles, until it terminates at the head of the inlet.

This branch of Observatory inlet is from one-half to one mile wide, terminating in a wooded swamp, fronted by a mud flat.

The water in Hastings arm is deep, and has no known anchorage ground. If proceeding into this channel, pass mid-channel between Brooke and Larcom islands, taking care to avoid the foul ground which extends half a mile northward from the former.

Alice arm, the eastern branch of Observatory inlet, from its junction with Hastings arm, runs in a north-easterly direction 11 miles. This arm is obstructed at its entrance by a small wooded island (Liddle island) which divides it into two channels 3 cables wide.

A rock, which dries about 5 feet at low water, lies $1\frac{1}{2}$ cables West from the south end of Liddle island.

A rock, with 10 feet on it, lies with the north end of Liddle island bearing S. 20° E., distant nearly 2 cables. The channel between this rock and Davies point has 6 fathoms in it, and is recommended in preference to passing between the rock and Liddle island.

Alice rock, with 7 feet on it, lies southward of Hans point, with the north end of Liddle island bearing S. 3° W., distant $1\frac{1}{3}$ miles. There is deep water on either side of this rock, but vessels should pass eastward of it, the western extreme of Brooke island in line with the western extreme of Liddle island leading half a cable eastward.

Perry bay, situated on the eastern shore at the entrance to Alice arm, is $2\frac{1}{2}$ cables wide, and takes a southerly direction for nearly one mile, with depths of 14 and 18 fathoms, mud bottom, in mid-channel.

Off its western entrance point lies a small islet (Sophy islet). At the head of the bay there is a salmon fishery (Muckshwanne).

Tides.—It is high water, full and change, in Observatory inlet at 1h. 5m.; springs rise 23 feet, neaps 12 feet. Abreast Nass bay, the ebb runs with great strength, the blue water being clearly defined when meeting the muddy waters of the Nass river.

The strength of the stream in Observatory inlet depends upon the freshets caused by the melting snow.

PORTLAND CANAL.—At about 20 miles from Wales point, an arm branches 6 miles N.W., with an average breadth of $1\frac{1}{2}$ miles. Here Pearse channel stretches S.W. From this the canal trends Northerly for about 55 miles to its termination. It possesses few and indifferent anchorages.

In places the mountains rise almost perpendicularly above the high-water line to the height of 6,000 feet.

The two rivers Bear and Salmon at the head of Portland canal are separated by a high ridge of bare mountains. On the east side of the valley of Bear river a mountain range extends in an east and west direction; mount Disraeli, the highest peak of the range, being a snow-clad pinnacle, 7,000 feet high. The delta of the Bear and Salmon rivers consists of a mud flat, which covers at high water, and extends over one mile from the mouth of the former river. This deposit of mud is nearly steep-to, breaking down suddenly to no bottom at 40 fathoms.

During the month of August, a current of about $1\frac{1}{2}$ knots an hour has been observed, setting down Portland canal, for 25 miles below the mouth of Bear river.

Timber, &c.—Pine and cedar are the principal trees met with, the former tall, and almost bare to the top, and frequently above 100 feet high. Cedars are found in many places of great size, with branches close to the ground. Maple trees are occasionally seen, being distinguished by their light and variegated tints of green. Yellow cypress is also met with, being distinguished from the pine by its leaf, convex on both sides, and by its peculiar odour.

The wood of the yellow cypress is light, tough, and durable, and useful for repairing or building boats.

Dogfish bay, situated on the eastern shore, about $3\frac{1}{2}$ miles north-westward of Ramsden point, is about $1\frac{1}{2}$ miles wide, half a mile deep, and faces the south-west; it is, however, filled by a sand flat at low water, rendering it useless as an anchorage. Windy islet is small, and lies close to the shore at the north entrance point of Dogfish bay.

Tree point, on the western shore, $4\frac{1}{2}$ miles from Portland point is low, wooded, and conspicuous, with high land at about one mile south of it. Tree point reef extends half a mile in a northerly direction from Tree point, and is nearly steep-to. Spit point, on the eastern shore, 6 miles from Ramsden point, is the turning point into the northern reach. Between Spit point and Dogfish bay several small wooded islets lie close to the eastern shore, and are connected with it at low water. A tongue of sand, which uncovers at low water, extends 3 cables south-west from Spit point.

Reef island, a small island lying on the western shore abreast Spit point, lies $2\frac{3}{4}$ miles N.W. from Tree bluff, and $1\frac{1}{4}$ miles W.S.W. from Spit point. Two small bays, with sandy beaches, lie under Reef island, in which a boat may find shelter. A reef with rocks awash at high water, and sunken rocks, extends 2 cables S.E. from Reef island.

Leading point, a high bold point, on the western shore, lies $2\frac{1}{2}$ miles north from Reef island. Dickens point is on the eastern shore, 4 miles from Spit point, the coast between them having a considerable curve to the eastward.

A small black rock, 8 feet above high water, lies close south of Dickens point, and a ledge of rocks which uncover, extends 2 cables from the point.

Sandfly bay, situated on the western shore, abreast Dickens point, is half a mile wide, and three-quarters of a mile deep in a north-west direction, terminating in a swamp with streams in the north-west and north-east corners. At the north point of the bay, two small islets lie close to the shore. Sandfly bay is nearly filled up at low-water by a sand-flat, with deep water close-to, and is therefore useless as an anchorage. Stopford point, bold and conspicuous, lies on the eastern shore, $3\frac{1}{2}$ miles from Dickens point.

Halibut bay on the western shore, 4 miles from Sandfly bay, is half a mile wide at its entrance, and extends back $1\frac{1}{2}$ miles in a N.W. by W. direction, having an extensive swamp at its head, through which three large streams flow. Off the south point of this bay lie a cluster of small black rocky islets.

The anchorage in Halibut bay is in mid-channel, at 3 cables within the entrance, in 6 to 10 fathoms, mud bottom. It is high water, full and change, at 0h. 30m.; springs rise $19\frac{1}{2}$ feet, neaps 15 feet.

Cross islet, a small wooded islet, connected at low water with the shore, lies close northward of Halibut bay. A rude wooden cross was found on this islet, placed there at some remote period, apparently to mark a grave. Logan point lies on the eastern shore, $3\frac{3}{4}$ miles from Stopford point. At 3 miles south-east of Logan point, is Dent mountain, 5,057 feet high. Camp point, on the western shore, is the turning point of the northern arm, which abreast of that point changes in direction from North to W.N.W.; it is wooded, bold, and precipitous.

Hattie island, situated nearly in mid-channel, abreast Camp point, is 400 yards long north and south with some stunted brush growing upon it. A ledge of rocks awash, and sunken rocks, extend 2 cables northward from Hattie island. The water is deep on either side of the island, beyond the distance of 2 cables from it, but the channel westward of the island is recommended.

Barclay valley lies on the eastern shore, abreast Hattie island; a large stream flows through it, and the neck of land separating Portland canal and Salmon cove (Observatory inlet) is here about 4 miles across.

Landslip point lies on the eastern shore, 2 miles northward of Hattie island. Three conspicuous landslips are seen on the mountains south of Landslip point. Bluff point terminates in a high bold cliff, and lies on the eastern shore, 2 miles from Landslip point. The channel abreast Bluff point is one mile wide. Breezy point, on the western shore, 4 miles from Camp point, is conspicuous, and the land recedes to the southward between Camp and Breezy points.

Tombstone bay lies on the western shore, 3 miles N.W. by N., from Breezy point. At its entrance, the bay is 3 cables wide, and takes a southerly direction, narrowing rapidly, until it terminates at one mile within the entrance at the mouth of a river.

An extensive well-wooded valley lies at the head of the bay, and on the north side of the valley, a remarkable mountain, with a snow-clad summit of dome shape, rises to the height of 6,500 feet. Trout are plentiful in the river flowing into this bay. Berries are found in abundance, especially the wild raspberry.

Maple point lies on the eastern shore, 3 miles from Bluff point. Maple trees grow upon this point, and when in leaf render it conspicuous. Immediately northward of Maple point is a bay, with a large stream flowing into it, fronted by a sand-flat. Swamp point, a low, marshy, wooded point, through which a river flows, lies 3 miles N.W. $\frac{1}{2}$ W. from Maple point. A sandspit extends half a mile to the southward from Swamp point.

Pirie point, situated 2 miles N.W. by W. from Swamp point, is high, bold and conspicuous. A sandspit extends 2 cables from the eastern shore midway between Swamp and Pirie points. White point lies on the eastern shore, 4 miles from Pirie point.

Turn point lies on the western shore, $1\frac{1}{2}$ miles from Tombstone bay and is high, bold, and conspicuous. Steep point on the western shore, 6 miles from Turn point, is bold and steep-to. Two large streams flow into the sea, mid-way between Turn and Steep points. Foggy point lies on the western shore, 6 miles N.W. $\frac{1}{2}$ W. from Steep point. Bay islet, on the eastern shore abreast of Foggy point, is small and wooded, and lies one cable off a point which divides two sandy bays, being connected with the point at low water. Green islets are two small, wooded islets, on the eastern shore, 2 miles from Bay islet. Close northward of these islets there is a considerable

tract of comparatively low land, thickly wooded, through which a large stream flows. Slab point, terminating in a high, smooth, slate-coloured cliff, lies on the western shore, 2 miles from Foggy point.

Blue point, on the eastern shore, $5\frac{1}{2}$ miles from Green islet, and $1\frac{1}{2}$ miles from Cliff point (on the western shore), terminates in high, bold cliffs, of purple blue colour, and basaltic formation. Close south of the point, an extensive wooded valley extends to the north-eastward, through which two large streams flow. A sandspit extends off their mouths to the distance of 2 cables. Cliff point terminates in high white cliffs, and is steep-to.

Verdure point, on the western shore, lies 4 miles N.W. by N. from Cliff point. The maple trees growing upon this point, when in leaf, render it conspicuous.

Mid-way between Cliff and Verdure points, there is an extensive wooded valley, through which a large stream flows in a south-westerly direction. Close northward of Verdure point is a bay, with a conspicuous sandy beach at its head. Landslip point, one mile N.W. by N. from Verdure point, is conspicuous, it having a high landslip over it.

Round point is the turning point, on the eastern shore, into the northern and last reach of Portland canal. With the exception of a small bay, which dries throughout at low water, the eastern shore northward of Blue point, for 6 miles, is high, bold, and almost inaccessible. The northern extreme of Round point lies 6 miles from Blue point.

Marmot river, on the eastern shore, $2\frac{1}{2}$ miles from the mouth of Bear river, flows through an extensive valley which lies in an easterly direction. A sandspit extends 3 cables off the mouth of Marmot river, and is steep-to. At the head of the valley, a mountain range with three conspicuous peaks, 4,000 to 5,000 feet high, extends in a north-west and south-east direction.

Salmon river, on the western shore, $1\frac{1}{2}$ miles from Bear river, is separated from that river by the Reverdy Johnson mountains, a range of bare mountains 4,000 to 5,000 feet high. It is a stream of considerable size, and the valley through which it flows is half a mile wide at its mouth, the river then takes a north-westerly

direction, widening to one and 2 miles, and is flanked by high mountains.

Bear river flows through an extensive wooded flat, at the head of the Portland canal, and divides near its mouth into several streams, from which, during the summer months, when the snow is melting, a considerable body of water passes out into the inlet. The valley through which this river flows extends 10 miles in a northerly direction from the mouth of Bear river, and is thickly wooded, and flanked by the Gladstone mountains, 4,800 feet high; it terminates at the foot of the Disraeli mountains, a range which extends in an east and west direction.

The Bear and Salmon rivers have a mud flat extending across their mouths, rendering communication, even by canoes, difficult at low water. Commencing at about 3 cables south of Salmon river valley, this deposit of mud extends across the canal in a north-easterly direction, passing over one mile from the mouth of Bear river. The edge of the bank is steep, breaking down suddenly to 24 fathoms.

Anchorage may be obtained in 25 to 30 fathoms, soft mud, about $1\frac{1}{4}$ cables below the Bear river flats on the eastern side; the holding ground is good, but the anchorage is unprotected, being exposed to the southerly winds coming up the canal and the northerly winds that sweep down the Bear river valley.

Tides.—It is high water, full and change, at the head of Portland canal at 1h. 30m.; springs rise from 23 to 27 feet, and occasionally 30 feet, neaps 15 to 20 feet. In August it was noticed that the night tides rose considerably higher than the day tides.

Observation spot, at the wooded high-water mark of the point near the centre of the mouth of Bear river, was found, by observations, to be situated in latitude $55^{\circ} 55' 43''$ N., longitude $129^{\circ} 59' 17''$ W.

See chart, No. 2,458.

CHAPTER XVI.

QUEEN CHARLOTTE ISLANDS.

VARIATION, $26^{\circ} 0'$ East in 1898.

QUEEN CHARLOTTE ISLANDS, consisting of three principal islands, may be regarded as a partly submerged mountain range,—a line drawn from the southern extremity of the islands to their north-western point, representing its axis,—which, together with several smaller islands, forms a compact archipelago, situated between the parallels of $51^{\circ} 50'$ and $54^{\circ} 15'$ N., and the meridians $130^{\circ} 54'$ and $133^{\circ} 10'$ W.*

The general character of these islands is mountainous and heavily timbered, and the mining resources are very extensive. The chief item of trade is in fur seals.

The channels between the main islands are named Houston Stewart and Skidegate, the former or southern channel separating Prevost and Moresby islands; and the latter, or northern, Moresby and Graham islands.

PREVOST ISLAND, the southernmost island of the group, is about $12\frac{1}{2}$ miles long north and south, with a breadth of $8\frac{1}{2}$ miles. The land gradually rises northward from cape St. James (its south point) till near Houston Stewart channel, where it has in places an elevation of about 2,000 feet, which heights, if the weather is clear, will be the first land seen on approaching Queen Charlotte islands from the southward.

The east coast of Prevost island is bold, and in many places bordered by steep cliffs. This part of the coast, between cape St. James and East point, a distance of 12 miles, is indented by two bays or inlets, the southern apparently inconsiderable, while Luxana bay, the northern, is probably 3 or 4 miles in depth. From East point the shore trends north-westward 6 or 7 miles to Moore head,

* See Admiralty charts:—Queen Charlotte islands, No. 2,430; scale, $m = 0.13$ of an inch. Also, Cape Caution to Port Simpson No. 1,923, *a* and *b*; scale, $m = 0.25$ of an inch.

the south-east entrance point of Houston Stewart channel. The shore is much broken, being penetrated by inlets which extend back among the high hills. Several small islands lie off it, one of which is bold, densely covered with trees, and has a height of 150 feet.

The western side of Prevost island, between cape St. James and the western entrance of Houston Stewart channel, for about 12 miles is apparently bold, but it is less known than the opposite side. The land near cape St. James is not so thickly wooded as that to the northward.

Cape St. James, so named by Captain Dixon who rounded the cape on St. James' day, 1787, in the *Queen Charlotte*, appears to be the southern extremity of an island one mile in diameter, the narrow channel separating it from Prevost island running W.S.W. and E.N.E. The southern point of cape St. James is a vertical cliff about the same height as the larger of the islets lying off it (180 feet).

The cape slopes gradually from a summit 1,000 feet high to the sea.

Cape St. James is situated in latitude $51^{\circ} 54' 0''$ N., longitude $131^{\circ} 2' 0''$ W.

Kerouart islets received their name from La Perouse, and consists of a chain of rocky islets and rocks which extend from cape St. James $3\frac{1}{2}$ miles in a south-easterly direction, corresponding with that of the mountain axis of the group. A sunken ledge is reported to extend $1\frac{1}{2}$ miles further in the same direction.

As seen at a distance of some miles to the north-east, Kerouart islets appear to form three groups, the first lying close to cape St. James, consisting of two large rocks (Hummock islets) 180 feet high, the second of one large and several smaller rocks, and the third and further southward, of two or three rocks of 100 feet in height, and a number of lesser ones. These islets are remarkable, standing boldly up with rounded tops, and vertical cliffs on all sides; the smaller rocks having the same pillar-like form so frequently found where a rocky coast is exposed to the full sweep of a great ocean. They serve as secure breeding places for innumerable gulls, puffins, and other sea birds.

Danger rocks.—About 3 miles northward of the eastern entrance to Houston Stewart channel, and at about 2 miles off the low and densely wooded point between the east entrance of Houston Stewart

channel and Carpenter bay, is a ledge of rocks, lying a little above water, on which the sea breaks violently, and for a considerable distance around; other rocks encircle these, but they are under water.

Approaching Houston Stewart channel from the northward, these rocks should be given a wide berth.

HOUSTON STEWART CHANNEL trends from Moore head W.S.W. for $2\frac{1}{2}$ miles to Hornby point, thence S.S.W. for 3 miles to the entrance from the Pacific ocean. Opposite the bend formed by Hornby point is Rose harbour. Louscoone, at the west entrance of the channel and just within Anthony island, is said to be a good harbour, similar to Rose harbour. The country round this locality is mountainous, mostly rising steeply from the coast, and thickly wooded; the trees, however, are stunted and show much dead wood, the roots holding to the almost naked rock. There is no arable land, and the soil is poor. Sea otters are numerous.*

Entering from the Eastward.—This entrance may be known by its bold south point, and the round thickly wooded islet. At about 4 miles from the entrance there are 90 fathoms water, and the depth gradually shoals to 20 fathoms to within one mile of it; from this distance off, the soundings are very irregular, varying from 30 to 7 fathoms over a series of ridges or bars of rock, sand, shell, and mud. In the entrance, which is about one mile wide, between Moore head and Langford point there are 20 fathoms water, with a rocky bottom.

Raspberry cove.—Within Forsyth point, at one mile westward of Langford point on the northern side, is a snug bay, bordered by a sandy beach, in which, at about two-thirds of a mile from Forsyth point, and at one-third of a mile from the beach, is a secure and convenient anchorage in 16 fathoms. In the north-west part of the bay is Raspberry cove, into which a stream of water flows.

Rock.—At a quarter of a mile westward of Forsyth point, and a little to the northward of the line of the direction of the channel, is a rocky patch with kelp on it which dries at low-water springs; do not therefore, haul to the northward too soon after entering.

On the southern side of the channel are some small wooded islands, here and there fringed with outlying patches of kelp, which latter should always be avoided.

* See Admiralty plans of ports. &c. in Queen Charlotte Islands, No. 2,168.

Trevan rock lies $1\frac{1}{2}$ miles W.S.W. from Forsyth point, nearly mid-channel, and contracting the passage on its northern side to rather less than half a mile; patches of kelp and Ellen island, the largest of the islands before mentioned, reduce the channel on the southern side of it to about one cable in width. Trevan rock is covered at high water; close to the north side of it the depth is 7 fathoms.

Anchorage.—There is a good anchorage to the eastward of Ellen island, in a bay formed by the island and a rocky patch which covers at half tide, at nearly half a mile eastward of the island. The anchorage is in 14 fathoms, mud, and the tidal stream is not felt.

Quadra rocks consist of a patch 120 yards long in a N.N.E. and S.S.W. direction, and 60 yards wide, the two shoalest spots being at either extreme with 6 feet water on them, 12 to 14 feet in other places, and 5 to 6 fathoms around. The patch can be seen at high water, and is marked at times during slack water by kelp; with the tidal stream running it is distinguished by overfalls and tide rips. From the west extreme of the rocks, Hornby point bears S. $\frac{1}{2}$ E. $5\frac{1}{2}$ cables, and south extreme of Ross island W. by S. $\frac{1}{2}$ S. The spring rise, in May, was observed to be 16 feet.

Rose harbour.—This secure and capacious harbour on the north side of Houston Stewart channel, takes a N.N.W. direction between Catherine point on the west and Ross island on the east, for 3 miles from its junction with the channel. For the first 2 miles the average breadth of the harbour is three-quarters of a mile, the western shore rising boldly with deep water close-to; the eastern shore, although high, has kelp along it, with shoal water, extending for one to $2\frac{1}{2}$ cables. The harbour then contracts to half a mile in width between two low points forming its head, beyond which is a basin, about 2 miles in circumference, filled with rocks and wooded islets, having on its western side Sedmond river, a small stream abounding in the season with geese and ducks. The land on its north and west sides is high and mountainous, whilst that on its eastern side is low. This basin is separated from South cove in Carpenter bay by a narrow neck of low wooded land.

Pincher rocks lie nearly 2 cables S. by E. from the east entrance point of the basin.

Entering from westward.—The southern arm of Houston Stewart channel is about 3 miles long, and three-quarters of a mile wide, with several small islands (Gordon isles) at its southern entrance. The shores of both sides are bold and densely wooded. Those from the southward bound in by this entrance, when abreast cape St. James, should close the land to $1\frac{1}{2}$ miles, and after coasting it for about 12 miles, the entrance will open. Two remarkable white stripes down the mountains, 6 or 7 miles to the north-westward, are excellent landmarks.

After passing at a convenient distance to the southward of Anthony island, the largest and outer island at the entrance, which is 200 feet high, with white cliffs (off the southern end of which an extensive ledge of rocks projects 4 cables in a south-west direction), the channel will show itself. Flat rock, 50 feet high, and resembling a haystack, lies much nearer the western than the eastern side, and which should be kept on the port hand, will be a good guide. There is an Indian village known as Ninstints, of the Skangoi tribe, on the inner side of Anthony island; the natives are very wild, and persons visiting or trading with them should be on their guard.

MORESBY ISLAND, the centre of the three principal islands of the Queen Charlotte group, is 72 miles long, but explorations on its east coast have resulted (by tracing out of the channels), in leaving it a mere skeleton, in places varying from only $1\frac{1}{2}$ to 2 miles in breadth. The highest and most rugged part of the island is probably in about latitude $52^{\circ} 30'$, where many peaks bear patches of perennial snow, and attain altitudes of over 5,000 feet. Also on Louise island, and about the head of Cumshewa, the land is very rugged, with many peaks of over 3,000 and 4,000 feet in height.*

Carpenter bay, the southernmost bay on the east side of Moresby island, is between Iron point on its north-western, and Islet point on its south-eastern side, a little over 2 miles wide, extending westward about 5 miles. It is not quite land-locked, but is sheltered from the only direction otherwise exposed, by a little rocky reef which extends out from its east side. On its south side are two small bays, the western of which, South cove, approaches near to the head of Rose harbour. At its head is good anchorage for a small vessel in from 6 to 10 fathoms.

Carpenter bay ends westward in a narrow arm, which receives two streams. It resembles the head of Rose harbour in being filled with

* See charts, Nos. 1,923b, 2,430.

small rocky islands, and rocks, making it unsafe for even a small craft. The general character of the country surrounding the bay is like that of Houston Stewart channel. In June there were many seals in the bay.

Collison bay, situated between Carpenter bay and Skincuttle inlet, is about $1\frac{1}{4}$ miles wide between Bluff point, its south-east point of entrance, and the north-west point, and has a probable depth of 2 miles. It runs up into a narrow arm, which has not been examined. Several small islands and rocks lie off its entrance, and it does not appear to be serviceable as a harbour.

Gull rock, 10 feet high, bears N.E. by E. distant $1\frac{1}{2}$ miles from Deluge point, and is three-quarters of a mile off Moresby island, between Collison bay and Skincuttle inlet. Inner Low rock lies S.S.E. from Gull rock, and midway between it and the shore.

SKINCUTTLE INLET is $5\frac{1}{2}$ miles deep in a south-west direction, with a width of 4 miles between Deluge point on the south and Granite point on the north side of its entrance. The north side of the inlet is formed by Burnaby island, and from the north-west angle Burnaby strait runs northward to Juan Perez sound, and separates Burnaby island from the east shore of Moresby island. The shores of Skincuttle inlet resemble those of other parts of the islands already described. Near the north-west angle of the inlet the mountains rise steeply to a height of 3,000 feet or more.*

The entrance to Skincuttle inlet is south of a chain of islands, called the Copper islands, lying E.N.E. and W.S.W. It is $1\frac{1}{2}$ miles wide, but should be used with caution as there is reason to believe that a rock, sometimes bare, lies in it. The passage to the north of the Copper islands is contracted, and with one or more rocks in its narrowest part.

Granite point is a rather remarkable whitish crag, joined to the main shore by a narrow neck of low land.

Bolkus islands, five in number, with many small rocks and reefs, form a chain about 2 miles long, lying east and west in the centre of Skincuttle inlet. The land is low, and on the western and largest of the islands the soil appears to be good, though now covered with dense forest.

*See Admiralty plan:—Skincuttle inlet, on sheet of Ports in Queen Charlotte islands, No. 2,168; scale, $m = 0.5$ of an inch.

A rock awash at high water lies midway between the Bolkus islands and the south shore, and at equal distances from the entrances to Harriet harbour and Huston inlet. Bush rock is situated one cable N.W. from the east entrance point of Huston inlet, and 8 cables W. | S. from it is Low Black rock.

Harriet harbour is 2 miles westward from the south entrance point (Deluge point), and extends southward one mile. It should be entered by the channel on the west side of Harriet island, which lies at its entrance, and a vessel should be kept near the west side of the channel (as several small rocks covered at high water lie along Harriet island), and run some distance beyond the inner end of the island before anchoring, to avoid the shoal bank which lies off its point. The depth is about 8 fathoms, with good holding ground, and the harbour is well sheltered from most directions, though subject to heavy squalls from the valley at its head when a southerly gale is blowing.

Huston inlet, $1\frac{1}{2}$ miles west of Harriet harbour, is a wide inlet which runs south-eastward about 4 miles, and then turns to the west, in which direction its extremity was not visited, but it approaches the western side of Moresby island to within about $1\frac{1}{2}$ miles.

Tangle cove.—At the western end of Skincuttle inlet are three indentations of the coast, of which the southern is George harbour. The northern, lying at the entrance of Burnaby strait, is Tangle cove, a well sheltered anchorage for a small vessel, but a shoal, the extent of which is unknown, lies off its entrance. The entrance is between a small island at its south side, and two other little islets to the north, and in it is a rock which uncovers at low water. The mountains at the head of Tangle cove are steep, and probably reach 3,000 feet in height; part of their upper slopes are bare of trees, but apparently covered with moss, where not composed of rock.

North side.—On the south shore of Burnaby island is a bay, with several small islands across the mouth of it, which may be a good harbour, but it has not been examined. Further east, in the vicinity of an abandoned copper mine, are Blue Jay and Kingfisher coves.

Burnaby strait, between the west shore of Burnaby island and Moresby island, is 9 miles in length between Skincuttle inlet and

Juan Perez sound, the southern portion for the distance of about 4 miles being narrow, but gaining at the northern end an average width of $1\frac{1}{4}$ miles. All parts of Burnaby strait must be navigated with great caution, as there are many rocks, and a large portion of them are covered at high water. Dolomite narrows, at $2\frac{1}{2}$ miles north of the southern entrance, are not more than a quarter of a mile wide, and here the channel is crooked, and obstructed by rocks and shoals, having from 6 to 8 feet at low water. The tidal streams, however, are not strong, but it cannot be recommended as a passage for any craft larger than a boat or canoe.

Just south of Dolomite narrows, from the west side of the strait, opens Bag harbour, expanding within to a basin nearly one mile in diameter. The Twins, nearly abreast of Dolomite narrows, on Burnaby island, are two conspicuous mountains estimated at 1,500 feet in height.

Island bay, at $1\frac{1}{2}$ miles North of the narrows, extends westward, and is 2 miles deep. It was so named from the number of small islands in it, about 17, and is probably too rocky for a safe harbour.

Skaat harbour, at the north end of Burnaby strait, is a bay $2\frac{3}{4}$ miles wide, with a depth of about 3 miles. Wanderer island and several smaller islets lie off the entrance. The harbour turns into a narrow inlet in its upper part, and terminates among high mountains forming a portion of the axial chain of the islands. Skaat harbour has not been sounded or carefully examined, but from the character of its shores it would be likely to afford good anchorage, especially westward of Wanderer island, and if so, it is the best for large vessels in this vicinity. The harbour will probably be found deepest on the Wanderer island side, as there is an extensive field of kelp off the opposite shore.

All Alone stone and Monument rock form good marks to the northern entrance of Burnaby strait, near which lies the entrance to the harbour. The entrance to Skaat harbour on the southern side of Wanderer island is very narrow; at the angle formed between it and the shore of Burnaby strait are two small coves affording anchorage for a small vessel, but with wide tidal flats at their head, which a short distance beyond low water-mark fall away rapidly into deep water.

Limestone rock is a dangerous reef, dry only at low water, but not extensive, though a second rock, also only dry at low water, lies a

short distance south-east of it. The eastern point of Wanderer island, in line with that of Centre island, leads clear of Limestone rock, one mile to the southward of the second rock.

Huxley island, at the northern entrance of Burnaby strait, is nearly 2 miles long north and south, and about $1\frac{1}{2}$ miles broad; it is bold and remarkable, rising rapidly from the beach to a height of 1,500 feet. Abreast the north-west point of the island, in mid-channel, a cast of 70 fathoms was obtained, with a fine sandy bottom.

Burnaby island.—The north shore of Burnaby island, $5\frac{1}{2}$ miles in length N.E. and S.W., is nearly straight on the whole, though with a few shallow bays, one of which is called Section cove. Alder island lies about the centre of this stretch of coast; it is about half a mile in diameter, nearly flat, with probably a good anchorage behind it, which should be approached from the north-west, as Saw reef runs out from the shore of Burnaby island to the eastward, and this part of the coast is broken and rocky, with large fields of kelp extending from it. The hills on the north side of Burnaby island are estimated at 300 to 500 feet in height.

From Scudder point, the north-east point of Burnaby island, the east side of the island trends southward, allowing the outer of the Copper islands to be seen. A considerable width of low land stretches back from Scudder point, covered with an open growth of large but gnarled spruces. Little beaches of coarse gravel fill the spaces between the low shattered rock masses, apparently caused by the action of a heavy surf.

JUAN PEREZ SOUND has at its entrance, between the north of Burnaby island and Ramsay island, a width of 8 miles. The sound extends westward, a number of smaller inlets and bays branching off from it, and is continued in a more northerly direction by Darwin sound, by which it communicates with the upper ends of the long inlets which extend westward from Laskeek bay. From the centre of a line joining the outer entrance points to the southern entrance of Darwin sound, Juan Perez sound is $13\frac{1}{2}$ miles in length.

On its south-western side are Werner bay, Hutton inlet, and De la Beche inlet, which terminate in narrow channels or fiords, extending among the axial mountains of Moresby island, and which have not been examined to their heads. From Werner bay two small inlets branch. Hutton inlet appears to be about 3 miles long;

De la Beche nearly 6 miles, with a low valley, hemmed in by hills on either side running north-westward from its extremity. None of these openings seem to be well adapted for harbours, as the shores are bold and rocky, seldom showing beaches, and the water to all appearances too deep for anchorage.

Bischoff islands, lying in the north-west part of Juan Perez sound off the south side of Lyell island, are low, but densely wooded. There is sheltered anchorage for small craft between the two larger islands, but it must be entered from the westward, and with much caution, owing to the number of rocks and sunken reefs which surround it.

Sedgwick bay, about 3 miles deep, on the south shore of Lyall island, is too much exposed for a harbour, as southerly winds draw directly up Juan Perez sound.

Ramsay, Murchison, and Faraday islands are the largest of a group of islands forming the north-east side of Juan Perez sound.

Ramsay island is $2\frac{1}{2}$ miles in length east and west, has bold hills rising in the centre, and is densely wooded. Its south shore is high, with some rocky cliffs; two small islets lie off the north-east side, which is rugged and composed of solid rock. The north-west shore has several coves, but none suited for anchorage.

Murchison island is $2\frac{1}{2}$ miles long; and Faraday island nearly 2 miles; both are low.

Between Ramsay and Murchison islands is a small group composed of Hot Spring, House, and a few smaller islets and rocks. On the south side of Hot Spring island is the spring from which it has its name. Its situation is easily recognised by a patch of green mossy sward which can be seen from a considerable distance; steam also generally hovers over it. The temperature is so high that the hand can scarcely bear it with comfort. The water has a slight smell of sulphuretted hydrogen, and a barely perceptible saline taste. The Indians bathe in a natural pool in which the waters of one of the streams collect.

Between Hot Spring and House islands is a good anchorage for small craft, sheltered on all sides but the north.

Tar islands.—Extending northward from the end of Murchison island is a chain of small islands about 4 miles long, named the Tar islands, as the Indians report that on one of them bituminous matter is found, oozing out among the stones on the beach. Agglomerate island, the southernmost, has apparently been burnt over, and is covered with standing dead trees. These islands are only approximately placed on the chart. Northward of them lies a single low island with a few trees on it, named Tuft island.

Rocks dry at low water lie between Faraday and Murchison islands, and there are several small rocky islets and low-water rocks in the vicinity of Hot Spring and House islands.

Entering Juan Perez sound.—Those entering the sound had better do so to the southward of Ramsay island, till the narrower channels have been surveyed. No bottom was reached with 94 fathoms of line in the centre of the sound south of Ramsay island, nor at about one mile south-east of the extremity of Bischoff island. The water is apparently deep throughout, but it has not been sounded.

LYELL ISLAND, about 15 miles in diameter east and west, and 9 miles north and south, is separated from Moresby island by Darwin sound. The island is composed of hilly land, mostly rising at once from the shore to heights of 600 to 900 feet, and attaining towards the centre of the island a height probably exceeding 1,000 feet. It is densely wooded, and on the low land has some fine timber. The east coast has not been surveyed. A thin inlet, on the north side of Lyell island, has not been examined; it is about 3 miles deep, with two main arms, and does not appear to be a good harbour.

Halibut bank.—About 3 to 4 miles E.N.E. from the north-east point of Lyell island is Halibut bank, with 23 fathoms water on it.

DARWIN SOUND lies between Lyell island and the west shore of Moresby island and from its southern entrance to White point is 12 miles in length N.W. and S.E.; in width it is irregular, but is a fine navigable channel. In the south entrance no bottom was found at 94 fathoms. When entering from the southward, Shuttle island appears to be nearly round. The channel on its eastern side should be followed, as this seems to be quite free from impediments. Abreast the north end of Shuttle island in this channel a cast of 18 fathoms was obtained. One mile beyond this

point, and in mid-channel, is a low rock which is not readily seen, with a second, uncovered only at low water, a short distance to the north of it.

Tidal streams.—The flood stream sets up Darwin sound from the southward into the various inlets, and then eastward to the open sea again by Richardson and Logan inlets. The ebb in like manner draws through from end to end in the opposite direction. The tidal stream runs at the rate of 2 knots at the strongest.

Bigsby inlet.—The south-west side of Darwin sound for 5 miles from the south entrance is rocky and broken, with several coves and inlets. At that distance is Bigsby inlet, extending $2\frac{1}{2}$ miles in a westerly direction. It is a gloomy chasm, scarcely half a mile in width, and surrounded by mountains probably as high as any in the islands. These rise steeply from the water, sometimes attaining in the first instance a height of 3,000 feet, and are in places nearly perpendicular, but are mostly well wooded. Further back, especially to the southward and westward, massive summits of bare granite rise to a height of 4,000 to 5,000 feet with their gorges filled with drifted snow fields. The inlet is almost void of anything like a beach.

Shuttle island, though low, is rocky. The channel to the west of it is probably deep enough for vessels of any class, but should not be used until surveyed. There is a rock, covered at high water, on the west side of its northern entrance.

ECHO HARBOUR.—At $1\frac{1}{2}$ miles northward of Shuttle island, and opposite the inner end of Richardson inlet, is Echo harbour. The passage into the harbour runs southward about one mile, and is surrounded by high hills which, towards its head, rise to rugged mountains. The outer part of the entrance has a depth of 10 fathoms in it, the sides then approach, leaving a channel scarcely 300 yards wide between abrupt rocky shores.

In the harbour proper the depth is everywhere about 15 fathoms, decreasing gradually towards the head for a short distance, and then running steeply up to a flat which is partly dry at low water, and above high-water mark forms a narrow grassy beach. The bottom is soft mud, and excellent holding ground. A very narrow passage leads westward from the bottom of the harbour into a secluded basin,

scarcely a quarter of a mile in diameter, which, with the exception of a channel in the middle, is nearly dry at low water. Into its head flows a large brook, coming from the mountains to the south-westward.

Klun kwoi bay.—At 2 miles west of the entrance to Echo harbour, the shore line falls back in Klun kwoi bay. The bay runs up in several arms, which have not been carefully examined, among the bases of rugged snow-clad mountains, which rise steeply from the shores, or at the sides of the valleys, by which the heads of the inlets are continued inland. The highest peaks are probably 5,000 feet or more in altitude. The mountains of Moresby island appear to culminate here, and are not such a prominent feature further southward. To this part of the range Perez's name of Sierra de San Christoval may be applied with the greatest propriety. The head of the bay approaches the southern arm of Tasoo harbour on the western side of Moresby island to within a couple of miles.

Crescent inlet may be considered as forming the extension of Darwin sound northward. It turns gradually through nearly half a circle from a north-west bearing to a direction nearly south-west, and is over 4 miles in length. It is a fiord, with steep mountains and wooded sides, but probably not so deep as most similar inlets, as there are stretches of beach of some length. It is not known if the Indians have any trail across to Tasoo harbour, to which, if correctly placed, the distance across cannot be great. Red top mountain, partly bare and about 3,000 feet high, is the most conspicuous peak in the vicinity, rising on the north side of the inlet, at the angle of the bend.

LASKEEK BAY is the name given to the wide indentation of the coast between the north-east extreme of Lyell island and Vertical point, the south-east point of Louise island, bearing N.W. and S.E. from each other, and 10 miles apart. From Laskeek bay four large inlets extend westward; of these the two southern, Richardson and Logan inlets, open into the head of Darwin sound.

The two northern inlets, Dana and Selwyn, communicate at their heads with the head of Cumshewa inlet to the northward.

Richardson inlet is about 11 miles in length in a W.S.W. and E.N.E. direction, with an average breadth of $1\frac{1}{2}$ miles, and is straight,

with moderately bold shores. The southern side is formed by Lyell island, A ti inlet being just within the entrance, and Dog island about 5 miles within it. Kun ga, Tan oo, and Inner islands, from east to west, form the northern side. Kun ga island is about 1,500 feet high, and forms a good mark for the entrance; there is a low rocky reef some distance eastward of the outer point of Kun ga, and a second off the south coast of the same island. Near Dog island there are several small islets and rocks; and at about $3\frac{1}{2}$ miles west of it, on the south side of the inlet, is a cove, where a small vessel can find a convenient anchorage, probably the nearest stopping place to Laskeek village. The channels between Kun ga and Tan oo and the latter and Inner islands are probably deep, though the first should be navigated with caution, and care taken to avoid the east end of Tan oo island, as several rocks and patches of kelp lie off it.

Laskeek or Klue Indian village is situated on the eastern extremity of Tan oo island. It is one of the most populous still remaining in the Queen Charlotte islands. The western end of Richardson inlet is contracted to a width of about a quarter of a mile, and obstructed by a small island and several rocks. There is anchorage off this village in 11 fathoms, about 2 cables East of the village. This anchorage is not a good one, being exposed to N.W. and S.E. winds, and is steep close-to. On anchoring, the houses should not be brought to bear south of West, as patches of rock stretch out two-thirds the distance across to the opposite shore from Laskeek point, so that going or coming from the north the east shore should be kept well aboard, it being steep-to. In the season, kelp marks the patches.

The tidal stream runs through Richardson passage with considerable strength, and it is unsuited as an approach to Echo harbour, though the most direct way in from the sea.

Logan inlet is about 7 miles in length, and nearly parallel to Richardson inlet, with Flower Pot island, a small bold rock, covered with trees, off its mouth. One other small island lies close to the shore on its southern side, but it is otherwise free from obstructions, and constitutes a fine navigable channel, the best approach to Echo harbour.

Enter to the north of Flower Pot island, and keep in the centre of the channel. Kun ga island, as already mentioned, is high. Ti tul island, small and with low limestone cliffs, lies northward of

See charts, Nos. 1,923b, 2,430.

it. Tan oo and Inner islands are also bold, rising to rounded hills of nearly uniform height of about 800 feet. They have some good gravelly beaches, though mostly rocky.

Timber.—In the inlets in the vicinity of Lyell island there is a considerable quantity of fine timber, trees growing in all moderately level and sheltered places.

Dana inlet runs about S.W. by W. nearly 8 miles, with bold shores; at its entrance is Helmet island, small, rocky, high, and of rounded form. A second small island is near it, and from most points of view the channel between the two is not seen, and care is necessary not to mistake this island for Flower Pot island, at the entrance to Logan inlet. At its western extremity Dana inlet turns northward, communicating by a narrow but apparently deep passage with Selwyn inlet, and thus cutting off Tal un kwan island from Moresby island.

Tal un kwan island is 8 miles long, and 2 miles broad; the hills are rounded in form, and from 800 to 900 feet high.

SELWYN INLET is nearly parallel to Dana inlet and about 10 miles in length, and near its head, turning northward, runs in that direction for a like distance, forming at high water a passage for canoes into the upper part of Cumshewa inlet, and separates Louise island from the main shore. The passage is narrow and walled in on both sides by mountains which rise very steeply from it. Entrance island is small and lies off the north entrance point with a low rock about one mile eastward of it.*

After giving the islets off the north entrance a wide berth, keep the north shore for a distance of 5 miles until the entrance of Rock-fish harbour is reached.

Rock-fish harbour is formed by a projection of low land, at the angle of Selwyn inlet, and extends in a W.S.W. direction for about $1\frac{1}{2}$ miles, with a width of half a mile, and an average depth of 15 fathoms. It is a secure and well sheltered anchorage, more easily entered than Cumshewa.

The head of the west branch of Selwyn inlet cannot be more than 9 or 10 miles from Mitchell or Gold harbour (on the west coast), as a low valley runs some distance westward. At about 3 miles from

* See Admiralty plan:—Selwyn inlet on sheet of Ports in Queen Charlotte islands, No. 2,168; scale, $m = 0.5$ of an inch.

the entrance of the passage leading to Cumshewa is the opening to an inlet about 3 miles deep in a south-west direction, approaching to within $4\frac{1}{2}$ miles of Mitchell harbour. These upper arms of Selwyn inlet are environed by high and rugged mountains.

Reef and Low islands are situated in the outer part of Laskeek bay. The southern and first named is steep along the water's edge, and a reef runs off about half a mile to the southward from it. Their exact position is not known.

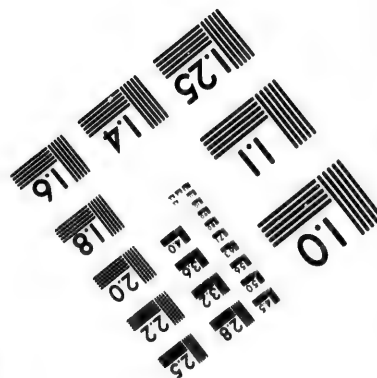
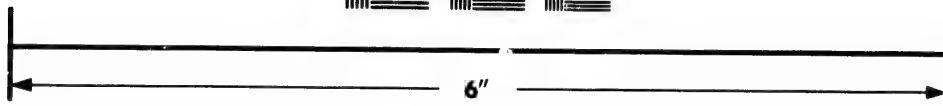
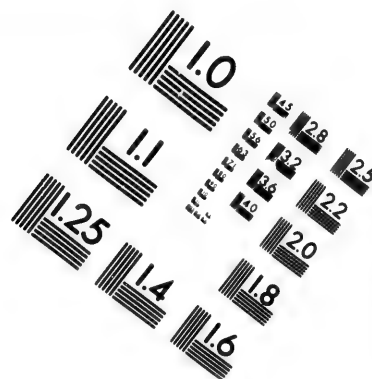
LOUISE ISLAND is about 15 miles long east and west, and 8 miles broad, with high mountains, and doubtless the snow on them lasts throughout the summer. From Selwyn inlet the east coast of the island trends north-eastward 8 miles, with several small bays, fully open to the sea, and mostly rocky.

Vertical point, the northern entrance point of Laskeek bay, projects at about half-way along this stretch of coast, and is remarkable from the shape of the beds of grey limestone of which it is composed, aggregating at least 400 feet in thickness. North of the point are the two small Limestone islands, behind which the tide running southward along the coast, forms a race on the ebb.

Skedans bay, about 2 miles from the entrance to Cumshewa, is strewn with sunken rocks and fully open, and should on no account be entered by vessels. A large stream enters its head, which can be seen at some distance inland forming a high waterfall, and which, according to the Indians, flows out of a lake of some size, high among the mountains. Skedans village forms a semi-circle round the head of a small bay or cove, very rocky, which indents the south side of a narrow isthmus, connecting two remarkable nipple-shaped hills with the main shore. This peninsula is situated at the south entrance point to Cumshewa inlet, and between it and the Skedans islands, the tide forms a race. Skedans islands, distant $3\frac{1}{2}$ miles from the shore, are low and covered with trees.

CUMSHEWA INLET extends about 15 miles westward, with a prolongation southward connecting it with Selwyn inlet. It differs from the inlets to the south, in the low character of the land on its northern shore. There is more beach along the shores than in the southern inlets, and wide tidal-flats, indicating shallower water, which is not only found in the inlet itself, but extends off the coast.

See charts, Nos. 1,923b, 2,430.



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Towards the head of the inlet, the shores are quite bold in some places, and the water probably deep.*

In the entrance of Cumshewa inlet, to the north of Skedans islands, are depths of 20 fathoms, with a shell and gravel bottom. Off the north point of entrance, Cumshewa island, a small barren rock, and the Cumshewa rocks, extend in a south-easterly direction nearly $1\frac{1}{2}$ miles. When coming from the north, therefore, keep well off the shore till the rocks are passed, and then stand in to the entrance in a north-westerly direction.

Kin gui island, just within the north entrance point of the inlet, is covered with dead trees, and can be recognised easily. At about one mile within the entrance, an extensive shoal, on which the sea breaks heavily, extends from the south shore, leaving a channel about half a mile wide between it and the north shore of the inlet. The passage in is through this channel, in which it is reported there are depths of 7 and 8 fathoms. A few patches of the shoal dry at low water, but the greater part is indicated only by the kelp which grows thickly on it during the summer. The tidal streams run strongly in the mouth of the inlet.

McKay cove, within the narrows, on the north shore, is a cove, where the shore dries out for some distance at low water, but off it a small vessel may find a pretty secure anchorage, though the tidal streams sweep round the cove.

Cumshewa village is situated on the north side of the inlet, about one mile westward of McKay cove, the houses being built along the shore of a bay facing south-eastward, $3\frac{1}{2}$ miles within the entrance. A small rocky islet, connected with the main at low water, lies off it.

Anchorage.—The best anchorage for a large vessel is probably to be found on the south side, $5\frac{1}{2}$ miles westward of Skedans point and abreast a stretch of low land, eastward of a stream.

The COAST.—From the entrance to Cumshewa inlet, the coast trends north-westward to Spit point, the south point of Skidegate inlet, a distance of 17 miles. It is indented by two considerable bays. Copper bay—the northern—about 5 miles from Spit point, received its name from some copper works which were carried on there at one time. The land is low, and very different in appearance from

See charts, Nos. 1,923a, 2,430.

* See Admiralty plan:—Cumshewa inlet, on sheet of Ports in Queen Charlotte islands, No. 2,168; scale, $m = 0.5$ of an inch.

that of the coast southward. The projecting points are mostly low and flat, and formed of gravel deposits. With the change in the character of the land, the beach becomes flat, and shoal water extends far off shore, the depths shoaling from 10 fathoms at 3 miles off Cumshewa island, to 6 and 7 fathoms at 7 miles off Spit point. Near Cumshewa the beaches are almost entirely composed of boulders, but show more gravel and sand toward Skidegate. The surface of the country is densely wooded with trees of large size.

Cape Chroustcheff, 2 miles to the southward of Spit point, should not be passed nearer than 5 miles; the cape is low and dark-looking. Coming from the southward, it shows very conspicuously; when abreast of it, Spit point, the low south point of Skidegate, becomes visible.

SKIDEGATE INLET, separating Moresby from Graham island, forms a spacious harbour communicating with the west coast at Buck point, south of Cartwright sound, by an intricate channel, only navigable for canoes a portion of the way. Skidegate inlet from its entrance extends in a south-westerly direction for about 9 miles from the Bar rocks, where it contracts to a width of $1\frac{1}{4}$ miles between Image point and Flowery islet on the north side of Alliford bay.*

Within these points it opens again, forming two expansions, separated by Maude island. That part of the northern expansion eastward of Lina island forms Bear Skin bay; the part westward of the island has several islands in it, with Anchor cove in the western end. Beyond Anchor cove it turns north-west, forming Long Arm; the total length of the inlet from Bar rocks to the head of Long arm being about 21 miles. The southern expansion forms South bay, in which is South island, its western side passing into Skidegate channel and thence to the west coast of Queen Charlotte islands.

The shore of Skidegate inlet is not so bold as those of the fiords to the southward, and is mostly fringed with a beach. The surrounding country is densely wooded, and where the land is flat, timber of magnificent growth is found. This inlet would be convenient in many respects as a site for saw-mills.

Spit point is low and wooded, and composed of sand deposits which, extending northward, form the bar which stretches across the entrance to Skidegate inlet.

* See Admiralty plan :—Skidegate inlet. No. 48; scale, $m = 1\cdot0$ inch.

The Bar or spit, with from one to 3 fathoms water on it, extends in a north-westerly direction for about $9\frac{1}{4}$ miles to within nearly $1\frac{1}{2}$ miles of Lawn point, the northern point of entrance. The spit slopes off very gradually seaward, while toward the inlet it rapidly deepens to 20 or 30 fathoms.

Bar rocks, on the outer edge of the spit, $2\frac{1}{2}$ miles from its extremity, are two in number; the western one dries 5 feet, and lies $6\frac{3}{4}$ miles N.W. $\frac{5}{8}$ N. from Spit point; the outer or eastern rock dries one foot, and lies 3 miles N.E. $\frac{1}{2}$ E. from Dead Tree point. The sea does not always break on these rocks.

A red conical buoy is moored in $3\frac{1}{2}$ fathoms, on the north side of Dead Tree point channel, with Inner bar rock N. by E., distant 7 cables.

Lawn point is generally green, with a small sand cliff and a large boulder in front of it; a hill 500 feet high rises immediately to the westward of the point. The coast southward of Lawn point is flat for 10 miles to Village bay, and is covered with standing dead trees.

Dead Tree point, $3\frac{3}{4}$ miles to the southward of Lawn point, is a projecting part of the coast, but otherwise is not conspicuous.

Village islands, in front of Village bay, form good marks for Skidegate inlet; the northern one (Bare islet), 125 feet high, is almost bare, and the other (Tree islet), having trees upon it, is 153 feet high.

Skidegate village, nearly half a mile in length, is situated in the bay, off which are the Village islands, and consists of many houses, with the usual carved posts, fronting the beach.

Village bay is a good stopping place; anchorage may be taken up between Bare islet and the beach in 14 fathoms. It is, however, exposed to S.E. winds. Should one of these gales spring up, good shelter will be found in Alliford bay.

Alliford bay, on the south side of the entrance, is an excellent anchorage, with good holding ground, in about 9 fathoms. The passage between Flowery islet and the North point of the bay should not be used. Wood and water may be obtained.

Danube rock, in the fairway of the inner part of Skidegate inlet, with about 4 feet on it at low-water springs, lies N. by E. $\frac{7}{8}$ E., 3 cables from the north-east point of Triangle islet.

Anchor cove, situated $10\frac{1}{2}$ miles from Village islands on the north side of the inlet, affords anchorage in 5 fathoms; anthracite coal is found on both shores of the inlet, but principally on the sides of mount Seymour, one mile westward of the cove.*

Cowgitz coal mine is about one mile in a N.N.E. direction from Anchor cove. The Queen Charlotte Coal Mining Company was formed in 1865 to open up the deposits of anthracite which had been discovered here, and abandoned in 1872.

Observation spot, on North point, Anchor cove, is situated in latitude $53^{\circ} 12' 31''$ N., longitude $132^{\circ} 14' 19''$ W.

Slate Chuck brook is the largest stream in Skidegate inlet, its mouth being about one mile north of Anchor cove. The brook receives its name from a quarry a few miles up its course, where the Indians obtain the dark shaly material from which they make carvings. In former years communication used to be kept up with the head of Masset inlet to the north by means of this stream, part of the distance being accomplished in canoe and part on foot.

Leading island, $3\frac{1}{2}$ miles southward of the Bare Village island, forms the western part of Alliford bay at the southern entrance to Skidegate inlet; it is 400 feet high and appears round.

Maude island, at the junction of the north and south expansions of the inlet, is nearly 4 miles long, S.W. and N.E., $1\frac{1}{2}$ miles broad, and 1,260 feet high. On the west end of the island the Indians belonging to Gold harbour (on the west coast) have established a village, on ground purchased from the Skidegate Indians. The Gold harbour Indians still preserve their rights over that region, and live there much of the summer, but find it more convenient to have their permanent houses near Skidegate.

Directions.—A deep channel into Skidegate inlet may be found northward of Bar rock spit by steering for Lawn point on a S.W. bearing until within about a mile of the point, when the water will deepen to 15 or 20 fathoms; from this point a general S.S.E. course may be steered, paying great attention to the soundings, until

* See plan:—Anchor cove on Admiralty chart. No. 48; scale, $m = 12$ inches.

the west side of Leading island comes in line with the east side of Bare island, bearing South, when steer as requisite up the inlet.*

The deep portion of the channel from opposite Lawn point till past the north-west point of Bar rock spit (or until the Boulder at Lawn point bears W. by N.) is only one-third of a mile wide; attention to the lead and steering, with a sharp look out, is therefore necessary, as previously remarked.

The west side of Leading island, in line with the east side of Bare Village island bearing South, leads over the Bar rock spit, to the northward of the rocks, in 15 feet at low water, from whence the depth is from 20 to 30 fathoms to Village islands; passing to the southward of these islands anchorage may be found in the north-east side of Bear Skin bay in 12 fathoms, or, to gain shelter from a south-east gale, Alliford bay is recommended.

Coasting vessels with local knowledge use a passage with $3\frac{1}{2}$ fathoms over the spit, about one mile south of the Bar rocks (when they are visible), by keeping Dead Tree point bearing W.S.W. until the leading mark comes on.

Approaching Skidegate inlet the water should not be shoaled under 6 fathoms at low water until Lawn point bears S.W. or the leading marks are on.

Tides.—It is high water, at full and change, in Skidegate inlet at 1 h.; springs rise 17 feet, neaps 14 feet.

The COAST.—From Lawn hill, near Lawn point at the entrance of Skidegate, to Rose point, the north-east extreme of Graham island, the distance is about 48 miles. The coast line is straight and open, with no harbour, and scarcely a creek or protected cove for canoes or boats for long distances. The beach is gravelly and sometimes stony to the Tl ell river, beyond this it is mostly sandy to Rose point. For many miles northward cliffs of clay and sand are found alongshore, and for about 17 miles northward of Tl ell river these frequently rise into cliffs 50 to 100 feet in height. North of the range of cliffs the shore is almost everywhere bordered by sand-hills, which are covered with coarse grass, beach pea, &c., and would afford fine grazing for cattle. Behind these are woods, in some places burnt, and the trees generally scrubby. This part of the coast is also characterized by lagoons, and is evidently extending seaward, by the banking up of the sand under the action of the sea. The largest lagoon opens out

* See chart, No. 48.

at cape Fife about 6 miles to the southward of Rose point, extending southward for some miles, and is reported by the Indians to communicate with a second, further inland. The mouth of this lagoon forms a safe harbour for boats or canoes at high water, but is nearly dry at low water.

The coast between Skidegate and Rose point (having dangerous flats extending off it, which have not been examined, should be given a berth of 6 or 7 miles, and the lead kept constantly going whilst running along it, the depths varying from 9 to 11 fathoms.

Tl ell river enters the sea at $10\frac{1}{2}$ miles North of Lawn point, and is a stream of some size. For about 3 miles above its mouth it runs nearly parallel to the shore, separated from the sea by a low swampy strip of land only about half a mile in breadth. This land is of comparatively modern formation, being composed of sand and gravel, and is partly covered with spruce trees of no great size. The water of the river is of a dark coffee or amber colour.

Cape Ball (Kul tow sis), nearly 20 miles from Skidegate bar, is very conspicuous, having a remarkable white cliff on it, with lower cliffs on both sides; it cannot be mistaken. The Indians report that at very low tides patches of clay dry a long way off from the cape.

A rock with 2 fathoms on it, lies about 6 miles East from cape Ball.

Cape Fife.—Near this cape on some parts of the shore magnetic iron sand is abundant, with numerous colours of gold in it. There is anchorage off the cape with off-shore winds; in this neighbourhood the lead must be most carefully attended to.

Rose point, the north extreme of the Queen Charlotte islands, so named by Douglas in 1788, is known to the Haida Indians as *Nai koon*, or long nose. It is a remarkable low promontory, apparently formed by the meeting of the currents and waves from the southward and westward round this corner of the island. The inner part of Rose point, near cape Fife, does not differ from the low wooded coast to the south; the Indians say there are many lakes and swamps inland. Further out, where the point is narrower and more exposed, it is clothed with small stunted wood, which in turn give place to waving grass-covered sand-hills. Beyond this the narrow

gravelly point is covered above high-water mark with heaps of drifting sand, and great quantities of bleached timber, logs, and stumps, piled promiscuously together. The apex of the point is a narrow steep-sided gravelly bank, which extends for a long distance at low water.

A dangerous spit extends off Rose point in a north-easterly direction, for, it is said, a distance of nearly 5 miles, but its exact extent has not been ascertained. H.M.S. *Rocket* struck soundings in 7 fathoms at least 3 miles from the end of the spit, over which the sea was breaking heavily, and which has four or five sandy hillocks on it. The point should, therefore, especially in dark or thick weather, be given a wide berth. Several vessels have been lost on Rose point, which is a dangerous and treacherous point to round at any time, except in fine clear weather, and many Indians have been drowned there on different occasions.

Captain R. Brundige remarks :—" I examined Rose spit and found a " strong current of about 2 knots. This spit or sand-bank extends out " about 4 or 5 miles, with boulders and timbers, or large trees buried " in the sand. Soundings were found to be gradual, from 40 fathoms " down to 5 fathoms close along side ; also good even sounding all " the way to Masset with sandy bottom. Ships could anchor under " Invisible point in a south-easterly gale in 5 to 8 fathoms."

Rose point is situated in latitude $54^{\circ} 11' 30''$ N., longitude $131^{\circ} 36' W.$

HECATE STRAIT, between the Queen Charlotte group and the mainland of British Columbia, is 75 miles wide at its southern entrance, gradually narrowing to 25 miles between Rose spit (Graham island), and the Butterworth rocks on the eastern side of the strait. In the fairway of the south-east part of Hecate strait the water is deep. From Skidegate across to within 10 miles of the mainland, in a north-east direction, the depths are from 8 to 25 fathoms ; in some cases, growing kelp was passed through by the surveying vessel *Beaver* (1866) in 8 and 13 fathoms.

With the centre of Zayas island bearing N. by W. $\frac{1}{2}$ W., and the north extreme of Stephens island E. by N. $\frac{1}{4}$ N., the depth is 15 fathoms. This bank of soundings was found very useful on one occasion, during a strong breeze from the south-east, with thick weather, when H.M.S. *Virago* anchored on it and remained until it cleared up, and the land became visible.

Northward of a line drawn from Skincuttle inlet, across the strait to Banks island, the depth does not exceed 100 fathoms, and is generally much less. A similar shallow area borders Graham island to the north, and it is also probably comparatively shallow for some distance off the west coast of the northern part of the same island. From the vicinity of Masset a bank of sand not exceeding 20 fathoms extends to the north and east, trending with Rose spit, and on the east side of the island extending towards Cumshewa, its eastern margin reaching the middle part of Hecate strait. The average depth of water is from 7 to 10 fathoms, but there are much shoaler parts. This bank was named Dogfish bank by Ingraham in 1791. Near its eastern edge he places, in latitude $53^{\circ} 50'$ and about 30 miles S.E. (true) from Invisible point, a rock or shoal on which the ship *Margaret* struck in 1792, drawing 13 feet. Near the spot he notes 3 fathoms, deepening to 5, 7, and 12 fathoms eastward.

Shoal.—In lat. $53^{\circ} 26' N.$, long. $131^{\circ} 6' W.$, approximate, a shoal has been reported, but its position is doubtful.

Tidal streams.—In Hecate strait, the flood stream sets to the northward. In Dixon entrance, the flood coming from the westward round North island, sets along the Masset shore, across Hecate strait for Brown passage, spreading for about 15 miles round Rose point, towards cape Ibbetson (Edye passage), where it meets the flood from the southward; consequently between Rose point, cape Ball, cape Ibbetson, and thence south-east 15 or 20 miles, the tides are irregular.

The direction and rate of the tidal streams are not regular, being greatly influenced by the winds. At full and change they run with great strength. Time of high water over the strait generally is about 0h. 30m.

Between cape Murray, Percy point, and Zayas island, the tides are the strongest and most irregular, causing a heavy and confused sea, so much so, that in bad weather it has the appearance of breakers.

Rose point to Masset sound.—The shore between these two places form a bay 22 miles in width. With the exception of a few small rocky points, the beach is smooth and regular, and almost altogether composed of sand, with gravel in some places, sloping steeply above the ordinary high-water mark. Low sand-hills generally form a border to the woods which densely cover the land. The water is shoal far off the shore, especially at 15 miles from Rose

point, and on approaching Masset sound, where kelp forms wide fields at a great distance from the beach. In the north-east part of the bay there is anchorage with off-shore winds.

Hi ellen river, at 9 miles south-westward from Rose point, is a stream of some size, which is frequented by great numbers of salmon in the autumn. Its mouth forms a good boat harbour. On its west bank is Tow hill, an eminence remarkable in this low country, facing the sea with a steep cliff 200 feet high, composed of columnar volcanic rocks on one side, while the other slopes more gradually.

MASSET HARBOUR is rather more than 22 miles S.W. $\frac{1}{2}$ S. from Rose point, and should be approached with caution; the entrance is between a low point with a ledge of rocks covered with kelp, extending half a mile from it on the western side, and the point of a long spit partly dry (the surf usually breaking the whole length of it) on the eastern, the passage between having an extensive bar, upon which it is said there is a depth of 3 fathoms.*

Just inside and round the eastern point of inner entrance is a bay, with a beach, containing the principal village (Ut te was), off the centre of which there is anchorage in 10 fathoms. At this part the width of the harbour is nearly 2 miles, a large sand-bank tilling up its western side. The ebb stream runs very strongly, making this by no means a good anchorage.

Masset sound, from its seaward entrance to the point at which it expands to Masset inlet, is 19 miles long, and about one mile in average width. The depth, ascertained in a few places, varies from 10 to 12 fathoms. A number of small streams flow into it, most of which, according to Indian reports, have their sources in small lakes.

At its southern end it expands to a great sheet of inland water, 17 miles in length east and west, and in its broadest part $5\frac{1}{2}$ miles. This, to the northward and eastward, is bounded by continuous low wooded land; and to the west and south by hills, rising in the distance to mountains, rounded in form and about 1,500 feet high. About the heads of the inlets, and near the mouths of streams only, are small areas of flat ground found. Of these inlets, that which reaches furthest southward is called by the Indians Tin in owe.

See chart, No. 2,450.

* See Admiralty plan: Masset harbour, on sheet of Ports in Queen Charlotte islands, No. 2,168; scale, $m = 1.75$ inches. This plan, however, must be used with caution, as it has been reported defective.

On the south side of Masset inlet, 5 miles from its eastern extremity, is a narrow passage, the mouth of which is partly blocked by islands, but which leads into a second great inlet known by the Indians as Tsoo skatli. Kelp grows abundantly in the channel on both sides of the islands, which therefore cannot be very deep. The tide runs through them with great velocity, especially at ebb, when in the western channel it forms a true rapid, with much broken water.

Tides and tidal streams.—The rise of a spring tide at the entrance of Masset sound was estimated at about 14 feet, but, owing to the length of the narrow sound, Masset inlet has a tide of from 8 to 10 feet only; and the second or Tsoo skatli still less, about 6 feet. On one occasion, it was high water at the entrance of Masset sound 1h. 15m. p.m., while in the narrow entrance to Tsoo skatli, $23\frac{1}{2}$ miles distant, the flood had just caused a reversal of the current at 0h. 20m. Owing to the great expansion of the upper part of Masset inlet the tide continues to run up opposite Masset for about $2\frac{1}{2}$ hours after it is falling by the shore, whilst the ebb runs out for about 3 hours after the water has begun to rise on the beach.

Masset to Virago sound.—The coast between these two places is everywhere low and wooded, with occasional open grassy spaces, differing from the coast east of Masset, in being rocky or covered with boulders. No wide sandy bays occur, and the points are mostly of dark low rocks. The trees along the shore are not of great size, and are interspersed with occasional grassy spaces.

The water is shoal far off shore, with wide fields of kelp. The shore should be approached with caution, with the lead constantly going; there are some good anchorages, in which a vessel might remain a night instead of keeping under way, or cruising about with a south-east wind, and thick weather.

VIRAGO SOUND, the entrance to Naden harbour, is $4\frac{1}{2}$ miles wide between its outer points, capes Edensaw to the east and Naden to the west; and $2\frac{1}{2}$ miles deep to the narrow passage (which is $1\frac{1}{2}$ miles long and about half a mile wide) leading into the harbour.*

To the northward of the narrows, the west shore between Mary point, the western entrance of the narrows, and Jorey point, a distance of 2 miles, is bordered by a flat extending to a distance of about half

* See sketch of Virago sound on Admiralty plans of ports, &c., in Queen Charlotte islands, No. 2,168; scale, $w = 0.5$ of an inch.

a mile, and on the opposite shore, from cape Edensaw to Inskip point, a shoal also extends about the same distance; from the latter point a spit runs off to the westward for three-quarters of a mile, with a depth of $2\frac{1}{2}$ fathoms, contracting the channel, in which the least water is $3\frac{1}{2}$ fathoms, to a width of 4 cables.

The inner anchorage, on the western side, just within the narrows, is in 10 fathoms, at about 2 or 3 cables distant from the shore.

Naden harbour.—This capacious and land-locked harbour is about 4 miles in greatest length north and south, and 2 miles in width, with depths of 8 to 12 fathoms in it. Low land, densely wooded with spruce and hemlock of fine growth, borders the whole harbour. Rock appears on the shore only near the bottom of the harbour, and in the narrows.

Naden river flows from a large lake, which, according to Indian account, must be 10 miles or more in diameter, but is much encumbered by fallen trees, and its banks, except in a few swampy flats, are densely wooded. At high water a boat can proceed about 2 miles up. Stanley (Te ka) river, in the south-west corner of the harbour, is reported to be navigable for boats; and several smaller streams also enter the harbour. The spruce timber is excellent, and the harbour is well adapted for saw-mills and the export of lumber. In August, the Indians say that halibut and salmon are abundant, and geese and ducks come in large flocks.

Tides.—The rise and fall is about 13 feet.

Virago sound and cape Knox.—From cape Naden the shore and country behind it are mostly low, though with some rocky cliffs of no great height, and the points are rocky, but wide gravelly or sandy bays intervene. Some rocks occur at a little distance off shore, but there is no appearance of a wide shoal belt like that found east of Masset. Klas kwun point, $4\frac{1}{2}$ miles W. by N. from cape Naden, is a remarkable promontory, rising in the centre to a hill about 200 feet in height, which, owing to the flat character of other parts of the shore, is visible for a long distance. In a rocky bay to the east of the point, and open to the north-eastward, is Yat za village.*

Half-way from Klas kwun point to the east entrance of Parry passage is Jal un river; its mouth forms an excellent canoe or boat harbour

* See chart, No. 2,430.

at high water. At 3 miles further westward is a small promontory, on the east side of which is another excellent boat harbour; the Pillar is a very remarkable columnar mass of sandstone and conglomerate rock which stands near the eastern side, about 25 feet in diameter and 95 feet high.

Parry passage separates North island (which forms the north-western extremity of Queen Charlotte islands) from Graham island. The western entrance at the south-east angle of Cloak bay is three-quarters of a mile wide, but is contracted to less than 3 cables by foul ground which extends in a N.N.W. direction from a point on the southern side of the entrance. The passage proper is about 2 miles in length, with an average width of three-quarters of a mile. This channel, between the ledges of rock which extend off the southern side for about one mile and North island, is clear, but the tide rushes through it, forming a race.

The flood-stream runs eastward, leaving the east end of the passage with a north-easterly direction.

A small islet lies about one mile eastward from the eastern entrance, and a rock awash is reported $2\frac{1}{2}$ miles N.E. from the same locality, and about $1\frac{1}{2}$ miles from the southern shore of North island.

Just without the eastern entrance of Parry passage, and on the south side, abreast of Lucy island, is Bruin bay, affording anchorage in from 12 to 14 fathoms, sand. A line of kelp fringes the shore, which is studded with rocky patches and stones. This is not a good anchorage, as the flood sets into it from the passage, forming a number of eddies, and rendering it difficult to lie at single anchor without fouling it.

North island is about 5 miles in length, between North point and its southern extreme, and composed of low land, no point probably reaching a height of 300 feet. It is densely wooded. On the eastern side there is said to be a good anchorage in a bay which was formerly used by the vessels belonging to the North West Company. A small round high island situated close to point North, a prominent object in approaching, is named Thrumb. Remarkable wooden carvings are said to exist on the North island shore, or attached to the winter dwellings of the natives.

Cloak bay forms the western entrance to Parry passage, lying between the south-west shore of North island and cape Knox. It is

about $2\frac{1}{2}$ miles wide, and the same deep; the depths in the middle of the bay vary from 30 to 17 fathoms, sand, gravel, and shells, and it is protected from all except westerly winds. Some rocks, on which the sea breaks only in heavy weather, lie some distance from the North island shore, and there are also a couple of remarkable pointed islands on this side.

On the south side of North island, in Parry passage, is a snug cove named Henslung, in which whalers used occasionally to anchor. It is high water at full and change, at Henslung, at 0h. 20m., and the rise 16 feet.

Lucy island, on the north shore of Parry passage, is separated from the south side of North island by a narrow channel, on the north shore of which is a small Indian village, called Tartanne, which was in former years a place of importance. A reef runs off the east end of Lucy island, and a wide shoal with kelp stretches eastward from the southern extremity of North island. Between these lies the channel with 8 to 11 fathoms water. Abreast the Indian village the depth in the channel is 6 fathoms.

CAPE KNOX, the north-west extreme of Graham island, is a long narrow tongue of land, on which are a few low hills. The cape may be considered as a gigantic dyke of igneous rock running in an east and west direction. Its south side is bold, and off it lie several rocks in a westerly direction, the farthest out at a distance of about $3\frac{1}{2}$ miles from the cape. On these the swell of the Pacific seldom ceases to break with great violence.

Cape Knox is situated in latitude $54^{\circ} 10' 30''$ N., longitude $132^{\circ} 58' W.$

Directions.—On leaving Bruin bay or Henslung cove for the westward, a vessel may pass close to the cliffs forming the southern side of North island, and keeping at about half a mile outside the reefs that extend off the south shore (Graham island), get a good offing before hauling to the southward, to clear the rocks off cape Knox. When well out, the projecting point of Frederick island will be seen about 18 miles to the south-eastward. At 2 or 3 miles to the southward of Parry passage is an indentation of the shore, which might be taken as its entrance by a vessel coming from the southward,—a mistake that might lead to serious consequences, as the whole coast, as far as Frederick island, appears to contain several

open bays, with outlying rocks off each of them. The Indians, in their sketches of this part of the coast, do not draw any harbours, but merely exposed bays.

Frederick island lies about 14 miles S. $\frac{1}{4}$ W. from cape Knox. Behind this island Ingraham is stated to have discovered a commodious harbour in 1791, which he named port Ingraham. He places this inlet in latitude $53^{\circ} 47' N.$ The northern entrance is formed by two high bluffs with some small islets between them. Here Ingraham obtained 17 fathoms. Northward from the entrance on the coast is a large reef of rocks, and westward and southward from the southern point of entrance along the shore of Frederick island are a large number of sunken rocks. The port extends about 6 miles from the entrance in an easterly direction, is about 2 miles wide with four small islets near the head. In the vicinity of the islets is some kelp. At the head is a beach and 9 or 10 fathoms water. Towards the head the port curves more to the eastward. Half way towards the head Ingraham got 64 fathoms. The passage eastward of Frederick island has several islets in it and 6 fathoms water. Some kelp is noted in the channel; Ingraham places this south entrance in about longitude $133^{\circ} 5' W.$

Hippa island, lying 26 miles S.E. $\frac{1}{2}$ S. from Frederick island, appears from a position $1\frac{1}{2}$ miles seaward of Frederick island as high and bold; but from the south its outer end appears as a low point, and the inner end bold. This portion of the coast is higher and more broken than the former, the openings appearing deeper, neither does it seem to have so many rocks lying off it. The Indians show some good harbours towards Hippa. When abreast Hippa island, Buck point, 27 miles distant, and also cape Henry, about 18 miles further to the southward, can be seen, the coast presenting the same high and broken appearance as the preceding 26 miles. All the points along this part much resemble Buck point.

A rock, on which the sea breaks heavily, lies in Rennell sound, in approximately latitude $53^{\circ} 26' N.$, longitude $132^{\circ} 49' W.$

Buck point, on the northern side of Skidegate channel (which leads through to Skidegate), is rather low and rugged, jutting out from the high land at the back. It has a large high island just to the northward of it, and there is another, much smaller and peaked standing out clear of the land at about 3 or 4 miles farther to the

northward, and lying in the entrance of Cartwright sound, which is formed between Buck point on the south, and Hunter point on the north.

SKIDEGATE CHANNEL, the main entrance to which is about 7 or 8 miles to the eastward of Buck point, and is a little more than one mile in width, extends in an easterly direction for 6 or 7 miles to Log point, where it is one mile wide. Foul ground extends one mile westward from Skidegate channel south entrance point.

Dawson harbour is reported to be a secure anchorage on the north shore of Skidegate channel, 2 miles from the west entrance point, bearing S.W. $\frac{1}{4}$ W.

An island, about 2 miles in circumference, lies westward of the entrance to Skidegate channel, in a position bearing about West, distant 4 miles from the south entrance point of that channel. A rock, on which the sea breaks heavily, lies half a mile eastward of this island, or approximately in latitude $53^{\circ} 9\frac{1}{4}'$ N., longitude $132^{\circ} 32'$ W.

At Log point the West narrows commence, which lead to Skidegate inlet. About one mile west of Log point a branch turns off to the southward for one mile, and then westward to the Pacific, which it enters at about 3 miles to the southward of the main channel, forming an island $5\frac{1}{2}$ miles long by 2 broad, which rises to an elevation of 1,000 to 2,000 feet.

This passage is only adapted for canoes or boats, as it is blocked by a bank at its eastern end, with not more than 4 feet on it at high water.

The tidal streams from east and west meet about the East narrows, running through the channel with great strength, probably 5 knots in several places. The narrows must be passed at slack water of high tide, which lasts for a very short time, so that both narrows cannot be got through in one tide.

Inskip channel, leading round the north side of Kuper island, is about $8\frac{1}{2}$ miles long, and half a mile wide. A short distance outside it, there are some small islands on both sides, but there will be no difficulty in discovering the passage in. In the channel there was no bottom at 60 fathoms, but at the entrance a cast of 35 fathoms was obtained on a halibut bank. A short distance inside the islands

on the north side of the entrance, is a village belonging to the Kilkite tribes. Further in, on the same side, and about $3\frac{1}{2}$ miles up, is a deep opening, and where this and Moore channel meet are two other openings to harbours, with some small islands lying near them.

MOORE CHANNEL, on the south side of Kuper island, is 5 miles long in an E.N.E. and W.S.W. direction, and half a mile wide, the shore on each side being bold of approach, high, and covered with trees nearly down to the water's edge. In mid-channel there is no bottom at 70 fathoms. On the north side, just without the entrance, are some small rocky islets, named Moresby islands, and on the south side a few rocks close in shore.*

A heavy breaker, evidently on a rock, lies in the entrance to Moore channel, west side of Moresby island, in a position about N.N.W., distant $1\frac{1}{4}$ miles from cape Henry, or approximately in latitude $52^{\circ} 57' N.$, longitude $132^{\circ} 21' W.$

Mitchell or Gold harbour, about $2\frac{1}{2}$ miles deep and half a mile wide, is surrounded by precipitous and densely wooded hills, from 700 to 800 feet in height, and at its head in Thetis cove is a sandy beach and a stream of water. At $1\frac{3}{4}$ miles up the harbour is Sansum island, a small spot covered with trees. The anchorage lies half a mile further on, in Thetis cove, keeping Sansum island on the port hand, the passage being one cable wide, with deep water. This cove is completely land-locked, but squalls, frequently accompanied by rain, come over the hills with considerable violence.

Thorn rock lies one mile inside the mouth of the harbour, on the starboard side going in, and has 3 feet on it at low water; it lies about one cable from the shore; and on the opposite side, at not quite so great a distance from the land, but a little further out, is another rock. These are dangerous to vessels working in or out; but there is nothing to fear if the wind be fair and the ship kept mid-channel.

At one mile to the westward of Mitchell harbour, and on the same side of Moore channel, is the entrance to Douglas harbour, apparently very similar to the former, from which it is separated by Josling peninsula.

Directions.—The land being very high on both sides of the channels leading into the above harbours, influences the direction of

* See Admiralty plans :—Ports in Queen Charlotte islands, No. 2.168.

the wind which is either right in or out. Winds with any westing blow in, and those with easting the contrary. A sailing-vessel leaving Moore channel with a south-east wind should keep well over towards Hewlett bay, to enable her to fetch clear of the Moresby islands, as the wind will be very unsteady until well clear of the high land to windward.

Tides.—It is high water, full and change, at Moore channel, at 1h. 40m.; springs rise 13 feet, neaps 10½ feet.

TASOO HARBOUR.—Cape Henry, lying 3 miles from the entrance to Moore channel, terminates in a steep slope with a hummock at the extremity; 17 miles to the southward of this is the entrance to Tasoo harbour, the intermediate coast being high, and rising abruptly from the sea. The entrance is short and narrow, but the harbour itself is extensive, with deep water in many places, the anchorage being near some small islands on the port hand going in.

Between Tasoo harbour and cape St. James are other openings, which, according to Indian report, lead into good harbours, the southernmost of which is that leading into Houston Stewart channel and Rose harbour. Inside Anthony island, and close to Houston Stewart channel, is an opening called by the natives Lousecoone, and reported to be a good harbour, not unlike Rose harbour. This coast, excepting off Anthony island, is also apparently bold. The land near cape St. James has fewer trees on it than that to the northward.

Supplies.—The banks in and near Hecate strait, swept by strong currents, with the shore line of inlets and fiords, constitute the feeding grounds of the halibut and other fish, which abound in the vicinity of the islands. The halibut is the most important, and is largely consumed by the natives; the dog-fish is also very abundant, and is taken for the manufacture of oil; salmon run up most of the streams in large numbers, especially in the autumn; herrings are plentiful in some places, especially about Skidegate, at certain seasons; pollock or coal fish are caught on the north and west coast, and supplies an edible oil; flounders and plaice abound in some localities; cod and mackerel are also caught, and probably are abundant on certain banks at some seasons; while smaller fish and shell fish, oysters excepted, form an important item in the native dietary.

Immense flocks of wild geese and duck visit the northern shores of the islands in the autumn. Potatoes grow in abundance in most parts, and thrive exceeding well, forming an important article of food. These are all to be bought either for money, strong cotton shirts, cotton dresses, plain cotton, knives, tobacco, mother-of-pearl jacket buttons for ornamenting their blankets, or any of the articles commonly bartered among aborigines. The blanket is now, however, a recognised currency.

Bears are numerous, also martens, sea and land otters, which are caught for their furs, and mostly taken to the Hudson Bay Company's establishment at fort Simpson.

Caution.—From April to October the shell fish are said by the natives to be poisonous.

PLACE—ESQUIMALT.

OBS. A LAT. 48° 26' N. LONG. 123° 27' W.

METEOROLOGICAL TABLE COMPILED FROM SIX YEARS' OBSERVATIONS.

MONTH.	BAROMETER,* reduced to 32° and Sea Level.		TEMPERATURE.				RAIN.		WIND.									No. of Days Gale.	No. of Days Fog.	REMARKS.
	Mean Height.	Extreme Range.	Mean.	Mean Daily Range.	Max. Min.	Total Fall.	No. of Days.	Average Hourly Velocity.	Number of Days from											
									N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.			
January -	Ins.	Ins.	°	°	°	Ins	12											* 5 years' mean		
February -	29.89	—	37.5	—	55 8	2.97	12													
March -	29.83	—	40.7	—	70 22	2.81	12													
April -	29.87	—	43.0	—	70 22	3.05	16													
May -	30.00	—	48.1	—	86 38	0.58	6													
June -	29.93	—	52.3	—	80 37	1.03	8													
July -	29.99	—	56.6	—	84 40	0.56	4													
August -	29.96	—	59.8	—	79 45	0.13	3													
September	29.90	—	58.3	—	77 42	0.44	4													
October -	29.99	—	53.6	—	78 42	1.38	7													
November	29.97	—	49.0	—	70 32	2.70	12													
December	29.98	—	44.1	—	70 22	5.88	17													
Means and Totals	30.08	—	41.9	—	55 32	7 4.06	14													
	29.97	—	48.7	—	84 8	25.20	115													

No information obtainable.

PLACE—VICTORIA.

OBS. Δ LAT. 48° 25' N. LONG. 123° 23' W.

METEOROLOGICAL TABLE COMPILED FROM SEVERAL YEARS' OBSERVATIONS.

MONTH.	BAROMETER, reduced to 32° and Sea Level.		TEMPERATURE.				Clouds, 0 to 10, Mean amount.	RAIN.		WIND.									No. of Days Gale.	No. of Days Fog.	REMARKS.
	Mean Height, 2 years.	Ex- treme Range.	Mean, 7 years.	Mean Daily Range, 5 years.	Max. Min. 7 years.	Total Fall, 7 years.		No. of Days, 7 years.	Average Hourly Velocity.	Number of Days from											
							N.			N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.				
January -	2986	Ins.	°	°	°	—	Ins.	306	14										*September and October barometer means for one year only.		
February -	2977	—	37	11	56	8	270	9													
March -	2983	—	38	11	58	6	217	9													
April -	2984	—	44	15	67	20	144	11													
May -	2983	—	48	17	72	29	082	7													
June -	2989	—	53	17	80	30	038	7													
July -	2993	—	57	20	86	36	029	3													
August -	2989	—	59	23	85	37	058	3													
September	2997*	—	59	22	86	38	131	0													
October -	3001*	—	55	21	80	30	281	13													
November	2980	—	50	15	69	30	340	13													
December	2986	—	44	12	60	22	422	14													
Means and Totals	2988	—	49	16	86	6	2638	113													

No information obtainable.

PLACE—NEW WESTMINSTER. OBS. Δ LAT. 49° 13' N. LONG. 122° 53' W.

METEOROLOGICAL TABLE COMPILED FROM SEVERAL YEARS' OBSERVATIONS.

MONTH.	BAROMETER. reduced to 30° and Sea Level.			TEMPERATURE.			RAIN.		WIND. (3 years.)										No. of Days Gales.	No. of Days Fogs.	REMARKS.							
	Mean Height. 3 years.	Extreme Height. 5 years.	Extreme Low. 5 years.	Mean. 9 years.	Mean Daily Range.	Max. 9 years.	Min. 9 years.	Total Fall. 11 years.	No. of Days. 11 years.	Number of Days from																		
										N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.										
January -	Ins.	Ins.	Ins.	°	°	°	°	Ins.	Ins.	0	4	4	1	1	1	3	1	16										
February -	3007	144	33	—	—	57	2	6	587	14	—	—	—	—	—	—	—	—										
March -	3001	130	38	—	—	62	11	7	564	15	—	—	—	—	—	—	—	—										
April -	3000	109	43	—	—	72	21	7	538	18	—	—	—	—	—	—	—	—										
May -	3005	137	48	—	—	81	26	5	539	13	—	—	—	—	—	—	—	—										
June -	2998	068	54	—	—	86	27	6	298	14	—	—	—	—	—	—	—	—										
July -	3000	058	59	—	—	90	42	6	300	12	—	—	—	—	—	—	—	—										
August -	3002	042	62	—	—	91	40	5	221	8	—	—	—	—	—	—	—	—										
September	2999	057	61	—	—	85	41	5	246	9	—	—	—	—	—	—	—	—										
October -	3000	074	56	—	—	82	35	7	269	11	—	—	—	—	—	—	—	—										
November	2991	152	40	—	—	73	30	6	566	15	—	—	—	—	—	—	—	—										
December	2996	124	46	—	—	60	22	7	710	17	—	—	—	—	—	—	—	—										
Means and Totals.	3000	182	48	—	—	91	2	6	5548	144	—	—	—	—	—	—	—	—	3	31	53	43	71	35	16	6	107	—

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QUEBEC	-	T. J. Moore & Co.	-	-	118 & 120, Mountain Hill.
SAINT JOHN (N.B.)	-	A. B. Smalley	-	-	91, Prince William Street.
ST. JOHN'S, NEW-FOUNDLAND	-	Ayre & Son	-	-	231, Water Street.
"	-	George Knowling	-	-	Shipping Agent.
SHANGHAI	-	Lane, Crawford & Co.	-	-	Merchants.
"	-	Hirsbrunner & Co.	-	-	1, Nankin Road.
"	-	Kelly & Walsh	-	-	Shipping Agents.
SINGAPORE	-	Hon. Sec. and Treasurer	-	-	Sailors' Home.
SYDNEY (N.S.W.)	-	Turner & Henderson	-	-	16 & 18, Hunter Street.
TOKYO (JAPAN)	-	Takata & Co.	-	-	Merchants.
TORONTO (CANADA)	-	Charles Potter	-	-	31, King Street.
VANCOUVER (B.C.)	-	City, Thomson Stationery Co., Ltd.	-	-	108, Cordova Street.
VICTORIA (B.C.)	-	Hibben & Co.	-	-	66, Government Street.
ZANZIBAR	-	Port Officer	-	-	Post Office.

NOTE.—The agents in Tokyo for Japanese charts are the Nippon Yusen Kaisha.

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